AT&T LEC
TECHNICAL PUBLICATION

NOTICE

This Technical Publication is published by the AT&T Local Exchange Carriers (AT&T LEC) as a guide for the designers and manufacturers of central office equipment, including the providing of engineering and installation services relating to AT&T LEC communications systems or equipment. It is not intended to provide complete design specifications or parameters nor the assurance of the quality of performance of such equipment.

The AT&T LEC reserves the right to revise this Technical Publication for any reason, including, but not limited to, conformity with criteria or standards promulgated by governmental or regulatory agencies; utilization of advances in the state of the technical arts; or to reflect changes in the design of equipment techniques or services described or referred to herein.

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In performing services hereunder, the Installation Supplier agrees to limit its activities to those necessary and essential to performing such services, to not interfere with or misuse any non-AT&T LEC equipment or facilities on or adjacent to the AT&T LEC's facilities, to refrain from in any manner accessing customer lines to which customer has access and to indemnify and hold harmless the AT&T LEC for any inappropriate use of material or information.

[END OF SECTION]

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SECTION A -- INTRODUCTION

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1. GENERAL

1.1. Introduction

1.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all equipment added, rearranged or modified is properly installed and in conformance with AT&T LEC installation specifications.

1.1.2 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

1.1.3 ATT-TP-76300, AT&T LEC Installation Requirements, provides general requirements when doing equipment installation, modification, removals or building work activity in the central office environments of the AT&T Local Exchange Carriers (AT&T LECs).

1.1.4 Changes in this issue of Section A are summarized in Table A-1.

1.1.5 The AT&T LECs assume no responsibility for any costs incurred by a given manufacturer or Supplier in conforming to the requirements of ATT-TP-76300. Further, conformance to all requirements delineated in this document does not constitute a guarantee of acceptance of a given Supplier's product/service for use in the AT&T LECs.

1.1.6 AT&T reserves the right, without prior notice, to revise ATT-TP-76300 for any reason.

1.1.7 The AT&T LEC reserves the right to audit Installation Suppliers for compliance to ATT-TP-76300. Questions concerning the audit process or quality results should be referred to:

a) AT&T Midwest:

Installation Quality
65 West Webster.
Joliet, IL.60432
Attention: John Turrentine
jt2719@att.com

b) AT&T West:

Network Installation Quality Assurance
1611 Clayton Rd. Room 102
Concord Ca. 94520
ee1259@att.com

c) AT&T East:

Manager-Maintenance & Transmission
70 Broad St.
Second Floor
Middletown, CT 06457
bm2719@att.com

d) AT&T Southwest:

Sr. Engineering Manger – Network Quality
1014 13th St.
Huntsville, TX 77340
sg5238@att.com

1.2. Scope

1.2.1 ATT-TP-76300 applies to all types of telecommunication equipment installations, e.g., switching, transmission, power, etc and building infrastructure.

1.2.2 ATT-TP-76300 is applicable to all installation activities in the central office environments of the AT&T LECs, regardless of who performs the work. This includes AT&T LEC personnel, Competitive Local Exchange Carriers (CLECs) personnel, as well as any contracted installation suppliers performing work for the AT&T LEC or on behalf of CLECs. For installations at Public Safety Answering Point (PSAP) locations, refer to TP 76911MP.

1.2.3 The intent of ATT-TP-76300 is to familiarize the Installation Supplier with AT&T LEC installation procedural requirements by:

a) Covering the precautions to be taken to protect personnel and to prevent service interruptions and degradation during the installation activity.

b) Outlining the basic standards to which the Installation Supplier's performance will be expected to conform for job acceptance purposes.

c) Defining the necessary documentation used to detail the installation activity.

d) Defining installation start, job completion and job acceptance procedures.

e) Identifying the AT&T LEC involvement during the various aspects of the installation operation.

1.3. Definitions

1.3.1 Definitions of certain terms used in ATT-TP-76300 are as follows:

a) **AT&T LEC Equipment Engineer** - the AT&T LEC equipment engineering representative or the AT&T LEC real estate management representative who is directly responsible for the installation in progress and who has overall responsibility for ensuring job completion and acceptance.

b) **AT&T LEC Representative** - The AT&T LEC person(s), designated by the AT&T LEC Equipment Engineer, who has responsibility for the daily coordination between the Installation Supplier's on-site personnel and the AT&T LEC.

c) **Installation Supplier** - The provider of installation services, including telecommunications equipment and building infrastructure installation service providers, as well as AT&T LEC personnel who perform installation activities, within the central office environments of the AT&T LEC.

d) **Central office environment**- AT&T LEC owned or leased premises where network elements are located.

e) **DESP** – Detail Engineering Service Provider

f) **High Seismic Zone** – Earthquake zones 3 and 4 as defined by USGS (United States Geological Survey).

g) **Installation activity** - Any activity provided by an Installation Supplier including, but not limited to, additions, modifications, removals, work performed on building infrastructure, and/or other contractual services performed within the central office environments of the AT&T LEC.

h) **Low Seismic Zone** - Earthquake zones 0, 1, and 2 as defined by USGS (United States Geological Survey).

i) **Shall** - Something that is mandatory and subject to audit.

j) **Should** - Something that is recommended.

k) **AT&T LEC** - AT&T Communications Inc. Local Exchange Carriers.

l) **Yellow wallet** - A standard accordion folder with cover, minimum size 9" X 12", in which job documentation to remain at the site shall be filed.

1.4. General Requirements

1.4.1 Unless otherwise indicated on the Checklist of Current Sections, ATT-TP-76300 requirements become effective for jobs completing 90 days or more after the section issue date. The Checklist of Current Sections at the front of ATT-TP-76300 indicates the issue date and the effective date of each section. Revisions may be issued on a section-by-section basis. Along with the revised section(s), an updated Checklist of Current Sections will be issued to indicate the current issue date and effective date for each section.

1.4.2 The Installation Supplier shall contact the AT&T LEC Equipment Engineer to request any variance from ATT-TP-76300. The Installation Supplier shall provide documentation of approved variances in the yellow wallet at the job site.

1.4.3 The Installation Supplier shall have the ATT-TP-76300 currently in effect available (may be electronic or paper copy) at the job site.

1.4.4 The Installation Supplier shall have the detail specification available (may be electronic or paper copy) at the job site.

1.4.5 The Installation Supplier shall have available (may be electronic or paper copy) at the job site a copy of the appropriate AT&T LEC equipment and interconnect drawings**.**

1.4.6 The Installation Supplier shall have available, electronically or paper, at the job site a copy of all furnished manufacturers' drawings as required in the detailed specification.

1.4.7 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

1.4.8 The Installation Supplier shall refer questions pertaining to the detail engineering of the job to the appropriate detail engineer.

1.4.9 The Installation Supplier shall notify the Detail Engineering Service Provider (DESP) and the AT&T Equipment LEC Engineer in writing, of any conditions or items that do not meet the job documentation and ATT-TP-76300 requirements.

1.4.10 The documents listed in Table A-2 support ATT-TP-76300 and provide additional details. The Installation Supplier shall have access to these documents and shall refer to them as needed.

1.4.11 The Installation Supplier shall correct all defects within 30 days of notification, unless otherwise specified.

1.5. Quality Assurance Programs

1.5.1 The Installation Supplier shall comply with all Quality Assurance Programs as specified by the Regional Quality Assurance Organizations in support of Common Systems requirements.

1.6. Proprietary Information

1.6.1 All proprietary documents referenced in ATT-TP-76300 are available to contracted Suppliers through signed nondisclosure agreements or as detailed in current contracts between the AT&T LEC and the Supplier.

1.7. Ordering Information

1.7.1 Internet access is available to approved suppliers for downloading electronic copies of ATT-TP-76300 and other non-proprietary AT&T LEC references. Information concerning internet access can be obtained from:

Vickie Jefferson
111 S 3rd AVE, 1st Floor
Madill, OK 73446
vj6542@att.com

1.7.2 Non-AT&T LEC publications referenced herein should be obtained from the originator of the publication.

1.8. Comments On ATT-TP-76300

1.8.1 Comments on ATT-TP-76300 shall be submitted by e-mail or in writing to:

Laurie Gustin
Area Manager
201 S Douglas St., Room 111
El Segundo, CA 90245
lg1376@att.com

TABLE A-1 – SUMMARY OF CHANGES IN SECTION A

Change	Item in 11/1/05 Issue	Item in this Issue
Revised	Table A-2	Table A-2
Deleted		
Added		

TABLE A-2 – REFERENCES IN ATT-TP-76300

Reference	Title
ATT-TP-76900	AT&T LEC Installation Testing Requirements
ATT-TP-76911	AT&T LEC E911 Requirements
NFPA 701	
UL 214	
ASTM D1048-81	
ASTM D1048-88a	
National Electrical Code	
ATT 801-601-900	AT&T Alarm Standards Practice
ATT-812-000-032	Common Systems Through Penetration Firestopping Requirements
ATT-TP-76202	Lumicool Lighting Fixture EF&I Methods and Procedures
ATT-TP-76416	Grounding and Bonding Requirements for Network Facilities
ATT-C-98022-71	SNET Building Ground System (AT&T East)
ATT-W-98023-31	Building Ground & Equipment Ground System (AT&T East)
ED-97729-11	Protective Grounding Systems for Central Office Equipment
Quality Assurance Programs	Service Interruption Program
ATT-TP-76201	Common Systems Hardware Products and Materials Specifications
Quality Assurance Programs	Major Safety Violation Program
ATT 800-000-101MP	Anchoring Requirements
Quality Assurance Programs	Standards of Conduct
ATT-TP-76306	Electrostatic Discharge Control

[END OF SECTION]

SECTION B -- GENERAL INSTALLATION REQUIREMENTS

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1. GENERAL

1.1. Introduction

1.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all equipment added, rearranged or modified is properly installed and in conformance with AT&T LEC installation specifications.

1.1.2 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

1.1.3 This section covers general requirements related to safety, environmental, care of building facilities and premises, compliance with laws, rules and ordinances, and equipment preparation for installation.

1.1.4 Changes in this issue Section B are summarized in Table B-1.

1.1.5 Many of the items addressed in this section (e.g., building facilities, building conditions, etc.) will require joint AT&T LEC/Installation Supplier review in advance of the actual installation activity. Sufficient time will be incorporated into the total job schedule to allow for alterations, additions (prior to the equipment installation timetable) and/or the additional expense approval by the AT&T LEC Equipment Engineer.

1.1.6 For warranty purposes, the equipment manufacturer may have documented installation requirements pertaining to the "foot print of the equipment." If these requirements conflict with the requirements given in ATT-TP-76300, the manufacturer's requirements shall apply.

1.1.7 The Installation Supplier shall provide at a minimum, a Level 3 representative (see Section C) on-site to oversee any non-volatile work performed by the Installation Supplier's non-approved subcontractors.

1.1.8 The Installation Supplier shall provide a Level 4 representative (see Section C) on-site to oversee any volatile work performed by the Installation Supplier's non-approved subcontractors.

1.2. Safety

1.2.1 The Installation Supplier shall be entirely responsible for the safety and instruction of its employees or representatives.

1.2.2 All temporary installations shall adhere to the safety requirements for permanent installations.

1.2.3 The Installation Supplier shall take precautions to avoid harm to personnel, equipment and building (e.g., cutting installed threaded rod).

1.2.4 The Installation Supplier shall suspend work operations immediately when so instructed by the AT&T LEC.

1.2.5 The Installation Supplier shall immediately report to the AT&T LEC Representative any accident, outside agency inspection or hazardous condition, including:

a) Any accident or injury that occurs to employees or subcontractors of the Installation Supplier while on AT&T LEC premises.

b) Any OSHA inspection or citations issued to the Installation Supplier while on AT&T LEC premises.

1.2.6 Floors and work area shall be kept free of all potential hazards. The Installation Supplier shall avoid creating a slip or trip hazard.

1.2.7 All combustible materials stored overnight in the equipment area shall be completely covered with a fire retardant and anti-static tarp. The tarp shall meet NFPA 701 or UL 214, be clearly marked as such and have a surface resistivity between 10^5 and 10^{12} ohms psi.

1.2.8 The Installation Supplier shall store flammable materials i.e. spray paint, solvents, etc., outside the building in a fire rated cabinet, if available, or remove the material from AT&T LEC property.

1.2.9 All waste materials, such as waste paper, foam, plastic, cloth bags, packing boxes, packing material and similar material supplied during the installation, shall be removed from the building by the Installation Supplier on a daily basis (or more frequently if required).

1.2.10 All walkways, entrance and exit routes through the equipment area shall be kept clear of tools, equipment, equipment packaging, cable, etc. Caution signs shall be posted where needed.

1.2.11 The Installation Supplier shall not obstruct doorways, equipment aisles, corridors, stairs, fire exits, fire extinguishers and fire fighting equipment, pull box alarms and electrical breaker/fuse panels.

1.2.12 If the Installation Supplier has any questions in regard to safety, contact the AT&T LEC Representative.

1.2.13 The Installation Supplier shall ensure the following during the installation:

a) That its employees are informed of any hazards that may exist on the job and the action required, minimizing the risk of personal injury, property damage, or service interruption. Furthermore, all Installation Supplier personnel shall comply with the safety guidelines and policies that are followed by the AT&T LEC in installation equipment areas (e.g., safety glasses).

b) That personal protective clothing and equipment, such as cotton gloves, heat resistant gloves, low-voltage rubber gloves, ear protection, safety eyeglasses, etc., are provided and used to minimize the risk of personal injury.

c) That combustible furniture is not brought into equipment areas.

d) That apparatus or materials are not stored in equipment aisles, corridors, stairs or fire exits.

e) That Installation Supplier's personnel adhere to the AT&T LEC's non-smoking policy.

f) That precautions are taken to prevent fire resulting from the use of temporary wiring, test wiring, lamps, soldering irons and other similar equipment.

g) That Installation Supplier personnel are familiar with the building's evacuation features.

h) That Installation Supplier personnel are familiar with the location and use of the fire extinguishing equipment in the installation area.

1.3. Safety, Tools and Precautions

1.3.1 The Installation Supplier shall provide its own tools.

1.3.2 Extension cords shall be NRTL listed, three conductor, 14 gauge or larger, commercial grade.

1.3.3 All tools used for installation activities on and adjacent to "hot power" environments, (e.g., the common battery supply and grounded battery return in the power room or area, and power distribution boards, cabinets or bays, BDFBs, PCFDs and GPDFs), shall be factory (OEM) double insulated. Only double insulated compliant single ended box and open end wrenches,

socket sets (including compliant ratchets, sockets, extension bars and torque wrenches), nut drivers, screwdrivers and hex (allen) type wrenches are approved for hot power installation.

1.3.4 All battery and AC powered tools shall be double insulated.

1.3.5 The Installation Supplier shall inspect all tools that are used for installation activity in the AT&T LEC equipment areas before the start of each shift.

1.3.6 The Installation Supplier shall remove all personal jewelry when performing any installation activities.

1.3.7 Safety goggles, face shields, appropriate protective clothing for the job being performed (i.e. battery apron and gloves) shall be worn when working with batteries. (ref OSHA technical manual Section 8 chapter 1)

1.3.8 Metal framed ladders, metal desks and metal chairs shall not be allowed in the immediate vicinity of telecommunication and power equipment.

1.3.9 Non-conductive measuring devices shall be used in the vicinity of working equipment.

1.3.10 Insulating floor mats shall be used for personal protection from electrical shock while performing work on or adjacent to power equipment.

1.3.11 Caution shall be exercised when working in the vicinity of equipment and tools with rotating components. Loose clothing may become entangled in the equipment.

1.3.12 Insulated blankets that comply with ASTM D1048-93 or ASTM D1048-88a shall be used when working in or around primary and secondary power equipment.

1.4. Environmental Management

1.4.1 The Installation Supplier shall follow the guidance provided in Sections G and V of ATT-TP-76300 when addressing Hazardous Materials and Waste management.

1.5. Vacuum Cleaners

1.5.1 A vacuum cleaner equipped with a High Efficiency Particulate Arresting (HEPA) filter may be used for removing metal shavings and other debris, except debris that contains or is presumed to contain asbestos. The vacuum cleaner used shall conform to the following requirements:

a) The HEPA filters shall provide a particle collection efficiency of 99.97% or greater for particle size of 0.3 microns or smaller.

b) Hoses and any other vacuum cleaner components that may come in contact with electronic equipment shall be made with insulating material.

1.5.2 When it is necessary to use vacuum cleaners in the central office environment, the following procedures shall be followed:

a) Vacuum cleaners shall be plugged into a wall- or pillar-mounted AC receptacle.

b) Electrostatic discharge (ESD) protection procedures, per Section N of ATT-TP-76300, shall be followed when vacuuming electronic equipment.

c) Bumping the vacuum cleaner into frames shall be avoided.

d) The secondary air source (exhaust) coming from any vacuum cleaner shall be directed to previously cleaned surfaces. Exhaust air shall not hit unclean surface where the dust could be disturbed.

e) When vacuuming on cable racks or other area above frames, the Installation Supplier shall cover the frames with ESD-coated sheeting to prevent debris from dropping into the frames.

2. BUILDING FACILITIES AND CARE OF PREMISES

2.1. Access

2.1.1 Hours of access shall be specified in the Job Start Agreement before start of installation activity. Written agreement is not required when an AT&T LEC employee accompanies the Installation Supplier for a site visit with no installation activity.

2.1.2 The Installation Supplier shall follow the directions from the AT&T LEC Equipment Engineer regarding the use of ID cards and electronic card keys and all metal keys.

2.1.3 Installation Supplier personnel shall wear his/her own approved company ID and their own AT&T approved Installation Supplier ID Card at all times while on AT&T LEC premises. The cards shall be worn at or above the waist with the front side showing. The AT&T LEC Representative may issue access cards and restrict Installation Supplier personnel to the facilities and dates specified on the card. Installation Supplier personnel shall surrender the card when so requested by the AT&T LEC Representative.

2.1.4 Installation Supplier personnel shall sign the AT&T LEC building register, where required, upon entering and exiting the facility.

2.2. AC Power, Heat and Light

2.2.1 The AT&T LEC will provide electric power for all necessary purposes, with suitable outlets in areas in which work is to be performed. AC outlets located in equipment bays are for test equipment only and shall not be used for power tools, powering telecommunication equipment or any building maintenance apparatus (buffers, vacuums, etc,). Heat and general illumination (of a permanent or temporary nature) in rooms in which work is to be performed or material stored, will also be provided by the AT&T LEC.

2.2.2 The Installation Supplier shall provide temporary lighting for specific work operations. Use of fluorescent lights or other lights requiring ballast shall be approved by the AT&T LEC Representative prior to their use. However, in no case should fluorescent lights requiring ballast be used without an Alternating Current Equipment Ground (ACEG).

2.2.3 The Installation Supplier’s personnel shall make no adjustments to controls, thermostats or venting of the heating or cooling plant. Any adjustments needed shall be directed to the AT&T LEC Representative.

2.3. Floor Space For Administrative And Equipment Storage Purposes

2.3.1 An agreement shall be reached with representatives of the AT&T LEC and the Installation Supplier(s) as to the availability of suitable floor space at installation start and during progress of the installation work, to be used for the following:

a) Storing major items of material. Floor space in equipment buildings shall not be used as warehouse space. Material shall not be stored in such a manner as to exceed the safe floor load of the building. If storage space is not available for storing job material, the Installation Supplier shall provide temporary storage space in a AT&T LEC approved area.

b) Administrative space and luncheon facilities.

1. Administrative space will only be provided at the location where the installation activity is occurring. Telephone services and office furniture are not included.

2. Food or drink shall not be brought into the equipment areas.

c) Storing tools and other property belonging to the Installation Supplier.

d) Restroom facilities and supplies such as towels and soap at all locations in which work is in progress.

2.3.2 The AT&T LEC will not be responsible for:

a) Providing parking facilities for Installation Supplier's vehicles without prior agreement.

b) The personal possessions of Installation Supplier's employees (e.g., jewelry, tools, etc.).

c) Mail or equipment delivery service arrangements for the Installation Supplier.

d) FAX or telephone service without prior agreement. All toll calls or charges are the responsibility of the Installation Supplier. When telephone services are to be used only for equipment testing purposes, the AT&T LEC Representative will arrange for the necessary services.

2.3.3 The Installation Supplier shall not use AT&T LEC trash containers without approval.

2.3.4 The use of radio frequency devices in equipment rooms containing telecommunications equipment is strictly forbidden. (i.e. cell phone, PCS, etc.).

2.3.5 Prior to entering a central office telecommunications equipment room, cellular and PCS telephones shall be turned completely off. Operation of these devices within central office telecommunications equipment rooms in any mode is strictly prohibited.

2.3.6 The use of two-way radios in equipment rooms is forbidden without AT&T LEC approval on a case by case basis.

2.3.7 Cameras and Photo Equipment are prohibited in any room or area housing electronic telecommunication equipment except for direct AT&T business purposes and with AT&T LEC approval. AT&T LEC approval shall only be given on a case by case basis.

2.3.8 Gas or electric welding/cutting equipment, torches or other open flame devices, and internal combustion engine-powered equipment will not be allowed in AT&T LEC buildings without permission of the AT&T LEC Representative.

2.3.9 The employees of the Installation Supplier will not be allowed to bring firearms or explosive devices, including powder actuated fastening devices, onto any AT&T LEC premises.

2.4. Openings, Alterations And Repairs To Buildings

2.4.1 The Installation Supplier shall contact the AT&T LEC Equipment Engineer if openings, alterations or repairs to buildings are required to allow material to be placed in position or to provide necessary openings and ducts for cables/conductors in the floors and walls.

2.4.2 Installation supplier shall contact the AT&T LEC Equipment Engineer if existing openings have not been previously closed properly, not fire stopped to requirements, too full of cables or opening requires attention.

2.5. Equipment Protection and Building Security

2.5.1 The Installation Supplier shall provide adequate protection of buildings and equipment. Such protection shall be of a nature to ensure against any possible damage, or wear and tear to, or degradation of operational, physical, chemical and/or electrical properties of buildings and equipment. The following are examples of protection and are not the only cases where protection is required:

a) An approved method of dust containment shall be used while drilling floors, walls, and ceilings. (See Section G of ATT-TP-76300 for floor drilling requirements.).

b) Fiberboard (e.g., Masonite) or approved floor mats shall be used to protect floors.

c) Existing equipment shall be protected, horizontally and vertically, to prevent damage during installation activities, as identified in the pre-start job meeting. The need for protection within a 10 foot sphere surrounding the equipment shall be considered.

d) Fiberboard (e.g., Masonite) shall be used to protect equipment from physical damage.

e) Anti-static and fire retardant tarp shall be used to protect working equipment from dust and debris. The tarp shall meet NFPA 701 or UL 214 and have a surface resistivity between 10^5 and 10^{12} ohms psi.

f) For protection of equipment that is cooled by either a forced air fan or a heat baffle, fiberboard, in the form of “pegboard” that is treated with approved flame-retardant shall be used. The pegboard shall be placed immediately before starting the daily activity and removed immediately after completion of the daily activity.

g) Stored cable reels shall be blocked or otherwise secured at all times to prevent their movement.

h) Cable shall not be dragged across unprotected flooring. The use of fiberboard or approved floor mats shall be used as floor protection while running cable in the central offices.

i) Electrostatic discharge protective devices necessary for handling and storing circuit packs and other sensitive equipment shall be provided and used by the Installation Supplier.

2.5.2 Installation Supplier personnel shall avoid climbing, standing, or performing any installation or removal activity while on cable racks. If an installation or removal operation cannot be performed from ladders, protection for the cables shall be provided. The protection provided shall be fire retardant and of sufficient size and thickness to spread the load of the installer's weight on the cables and prevent damage to sheathing of the top layer of cables.

2.5.3 The Installation Supplier shall post warning signage identifying overhead work activity in progress.

2.5.4 All frames waiting installation or transportation and not bolted in place shall be secured to auxiliary framing or a building column with webbed polyester/nylon or equivalent straps of at least 1 inch width. Straps and buckles shall be rated at a minimum 1000 pounds tensile strength. In low seismic locations, one strap can be used. In high seismic locations two straps shall be used.

2.5.5 The Installation Supplier is responsible for Installation Supplier caused damages. The Installation Supplier shall correct the damage or reimburse AT&T for repair of damage before final job acceptance.

2.5.6 The Installation Supplier shall not act as an agent of AT&T.

2.5.7 The Installation Supplier shall guard against and take the necessary steps to prevent unauthorized visitors from entering that portion of AT&T premise for which the Installation Supplier is responsible. Exterior openings (e.g. doors, windows, etc.) or interior security openings shall not be left open and unattended.

2.5.8 AT&T may designate the particular gate and/or entrance to be used by the Installation Supplier to enter and leave the premises during installation activity.

2.5.9 The Installation Supplier shall comply with AT&T security policies by ensuring that the premises are locked and secured at all times. All security devices such as windows, screens, fences, doors, gates and other similar equipment shall be in place at all times, except when temporary removal is necessary for the installation of equipment. Any security equipment temporarily removed or disabled by the Installation Supplier shall be replaced at the end of each working day.

2.6. Drilling in Ceilings and Walls

2.6.1 The Installation Supplier shall not install ceiling inserts unless authorized by the AT&T LEC Equipment Engineer.

2.6.2 Precautions shall be in place to protect equipment and personnel below, from falling debris.

2.6.3 Tools used for drilling holes into concrete ceilings shall be supplementally supported to avoid the craftsperson from having to hold tool unassisted.

2.6.4 A HEPA vacuum cleaner or drilling equipment equipped with a vacuum attachment shall be utilized when drilling holes in ceiling or walls.

2.6.5 If the drilling of holes in the ceiling or walls is within a 10-feet sphere or over working equipment, additional methods shall be utilized to isolate dust, debris or other air borne contaminates from central office equipment. These methods may include but are not limited to:

a) Anti-static, fire retardant sheeting or canvas may be used to contain dust and masonry from central office equipment.

b) Drilling with various containment devices designed to control dust, debris or other air borne contaminates from central office equipment (i.e. cone, plunger or sphere surrounding shaft of drill).

2.6.6 Methods utilized to isolate dust, debris or other air borne contaminates from central office equipment shall be addressed in a Job Start meeting.

2.7. Penetrating Waterproof Environments

2.7.1 Before drilling into any basement floor, basement wall, or power environment, the Installation Supplier shall determine from the AT&T LEC Equipment Engineer whether waterproofing has been provided and the special requirements for anchoring equipment.

2.7.2 Concrete slabs on grade that have been unintentionally drilled all the way through the slab shall be sealed with silicon caulking at bottom of hole prior to installation of floor anchors.

2.8. Cutting, Filing or Drilling of Metal and Plastic

2.8.1 The Installation Supplier shall strictly control the cutting, filing or drilling of metal or plastic to prevent the introduction of metal filings and other contaminates in all central office equipment areas.

2.8.2 Any work activity that requires cutting, filing or drilling of metal or plastic shall be performed outside central office equipment area. The Installation Supplier shall have the AT&T LEC Representative designate the location for this work activity.

2.8.3 The Installation Supplier shall maintain a clean work area by cleaning up the metal shavings and other contaminates as the work progresses.

2.8.4 Methods for cutting, filing or drilling of metal or plastic outside of central office equipment areas may include but are not limited to:

a) A HEPA Vacuum cleaner shall be utilized to control metal filings and other contaminants.

b) Cutting, filing or drilling activity shall be performed in a manner that will prevent metal filings and other contaminates from entering central office equipment areas (i.e. cutting, filing or drilling activity performed over and into boxed area outside of walkways)

c) All surface areas of this material shall be wiped clean of all metal filings and contaminates before material is brought into central office equipment areas.

d) Materials used for cleaning metal filings and other contaminates shall be disposed of outside the central office equipment area.

2.8.5 In unusual circumstances, where cutting, filing or drilling of metal or plastic can not be performed outside the central office equipment area, the following precautions shall be taken to prevent the introduction of metal filings and other contaminates into central office equipment.

a) A HEPA vacuum cleaner and/or cutting, filing or drilling equipment equipped with HEPA vacuum attachments shall be utilized.

b) Anti-static, fire retardant sheeting or canvas shall be utilized to control and contain metal filings and contaminates from central office equipment. Various methods of deployment of anti-static, fire retardant sheeting or canvas are acceptable depending on the work activity to be performed. Precautions shall be taken in all methods of deployment not to restrict airflow to central office equipment. Examples:

1. Placing or draping anti-static, fire retardant sheeting or canvas adjacent to central office equipment in cutting, filing or drilling work area.

2. Taping and forming anti-static, fire retardant sheeting or canvas in the cutting, filing or drilling work area to prevent metal filings or other contaminates from entering central office equipment.

3. Placing an anti-static, fire retardant sheeting or canvas curtain around the cutting, filing or drilling work area to prevent metal filings or other contaminates from entering central office equipment.

4. When extensive cutting, filing or drilling activities are required, an anti-static, fire retardant sheeting or canvas partition wall shall be utilized to prevent metal filings or other contaminates from entering central office equipment.

3. COMPLIANCE WITH LAWS, RULES AND ORDINANCES

3.1. Permits And Rights-of-Way

3.1.1 The AT&T LEC will provide the right-of-way, permits and authority for installation of equipment where the Installation Supplier is restricted from obtaining such right-of-way, permits, etc.

3.2. Laws, Rules And Ordinances

3.2.1 The Installation Supplier shall comply with all applicable federal, state, county and local laws, ordinances, regulations and codes.

3.2.2 The Installation Supplier shall comply with all applicable Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) regulations when dealing with hazardous materials and other work place hazards.

3.2.3 Where applicable, all work performed by the Installation Supplier shall meet or exceed the technical requirements of the National Electrical Code (NEC) and all state, county and local codes.

3.2.4 In the job start meeting, the Installation Supplier shall discuss with the AT&T LEC Representative any hazardous materials existing in the central office and/or hazardous materials to be used on the job and handled per the requirements of Section V.

4. EQUIPMENT

4.1. Cross-Connections

4.1.1 AT&T LEC personnel will normally be responsible for installing/removing cross-connect terminations before, during and following all installation activities.

4.1.2 If the Installation Supplier is instructed to install cross-connections as part of the installation activity, the cross-connect termination lists shall be furnished by AT&T LEC.

4.2. General Cleaning

4.2.1 The Installation Supplier shall perform general cleaning of the installed equipment and storage areas (e.g., cleaning floors of debris, packing material, etc.) daily during the entire installation period and at job completion for all types of installations.

4.2.2 The Installation Supplier shall ensure that all equipment is free of dust and foreign substances before being brought into an equipment area.

4.2.3 Cleaning shall be scheduled and performed consistent with local requirements. The frequency of required cleaning is affected by the type of ventilation and the presence of filtering systems. The Installation Supplier shall post the Material Safety Data Sheet (MSDS) form for chemicals used in cleaning operation.

WARNING 1: All cleaners and polishes used on central office equipment shall be silicone free.

WARNING 2: Spray cleaners shall not be used unless specifically authorized by AT&T LEC.

4.3. Test Equipment

4.3.1 The Installation Supplier shall use properly calibrated test equipment.

4.3.2 Test equipment owned by the AT&T LEC for equipment maintenance will not be available for installation purposes except in specific cases where prior arrangements are made with the AT&T LEC.

4.3.3 Any test equipment and/or spare equipment provided, as part of the job is the responsibility of the Installation Supplier. In most instances, the test equipment will not be turned over to the AT&T LEC until the associated equipment is turned over. However, upon request, the AT&T LEC personnel may have access to the test equipment to permit the checking of circuit features or to allow the testing of added equipment to which test circuits can access.

4.4. Installation Supplier Inventory and Inspections

4.4.1 The Installation Supplier shall make a visual inspection of all equipment and apparatus shipped to the job site (prior to installation) to identify any physical damage, defects or problems that may prevent its proper installation, maintenance and/or operation. The Installation Supplier shall notify the AT&T LEC Representative verbally as soon as practical and in writing within 72 hours of the verbal notification for resolution when damaged or defective equipment is discovered.

4.4.2 The Installation Supplier shall inventory all equipment and material shipped to the job site prior to job start. Equipment and material received after job start shall be inventoried as well. Questions and/or shortages shall be directed to the appropriate AT&T LEC Representative as specified in the job documentation.

4.4.3 All equipment reused from another job site and equipment relocated within the same job site shall be upgraded by the Installation Supplier to meet current ATT-TP-76300 requirements (e.g. replace mechanical lugs and parallel taps with crimp type lugs and H-taps, remove old stenciling, replace aluminum lugs with UL approved copper lugs, etc.). Information on equipment drawings rated Manufacturer Discontinued (MD) or Addition and Maintenance (A&M) shall be superseded by the latest apparatus and wiring figures, drawings and requirements.

TABLE B-1 – SUMMARY OF CHANGES IN SECTION B

Change	Item in 11/01/05 Issue	Item in this Issue
Revised		
Deleted		
Added		

[END OF SECTION]

SECTION C -- INSTALLER SKILL LEVEL ASSESSMENT

CONTENTS PAGE

1. GENERAL

1.1. Introduction

1.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all equipment added, rearranged or modified is properly installed and in conformance with AT&T LEC installation specifications.

1.1.2 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

1.1.3 This section provides criteria for qualifying the Installation Supplier's (also known as Installation Vendors) and their personnel to perform installation activities.

1.1.4 AT&T reserves the right to verify the vendors and their installer's skill level, and review the Installation Suppliers qualification process.

1.1.5 Changes to this issue of Section C are summarized in Table C-1.

2. VENDOR AND INSTALLER SKILL LEVEL REQUIREMENTS

2.1. Assessment of Vendor Qualifications

2.1.1 The vendor's qualifications are categorized as Tier 1 and Tier 2 as defined below. The vendor's rating level determines the type of work the vendor can perform.

2.1.2 **A Tier 1 Vendor** Is qualified to work in a AT&T central office in the system technology category that they have been approved in by the appropriate AT&T Engineering, LFO, and Quality organizations for the geographical region that approved them. The system technology categories that a vendor can be qualified to work in are listed below.

a) Common Systems

Cable racking, Iron work, Equipment frames (bay frame),MDF,FDF, and IDF COSMIC, Lighting, Building System grounding, Bay AC outlets, Etc.

b) Analog Switch

Switch installation to include secondary power distribution to the switch frames

c) Digital Switch

Switch installation to include secondary power distribution to the switch frames

d) Transport

Transport equipment installation including secondary power distribution to the Transport Frames

e) Power Equipment

All primary power work including power frame, equipment (includes Power Plants, Converter Plants, Ring Plants, Inverter Plants, Battery Plants, Engine Generator Plants, BDFBs), installation and connection to all primary equipment and frames.

f) **AC Installation Matrix**

Who does work on load side of AC panel*	CRE	Tier 1 Vendor (CV, Non-CV)	Tier 1 Power Vendor
PSC to AC receptacles and NE aisle lights	2**	1	1
Lighting Panel to NE aisle lights	2	1	1
Lighting Panel to building lights	2	N/A	N/A
PDSC (w/o network power load) to AC receptacles and NE aisle lights	N/A	1	1
PDSC (w/ network power load)	N/A	N/A	1
PPDSC to load	N/A	N/A	1
General purpose power panel to building receptacles	2	N/A	N/A

*An AC panel may be defined as:

Power Service Cabinet (PSC) is a general purpose AC panel that can be used for "Test" receptacles; convenience receptacles; lighting circuits and other general AC loads. These AC panels are generally, but not necessarily, connected to "essential" power which has standby engine backup.

Power Distribution Service Cabinet (PDSC) is a dedicated AC panel to distribute "essential" AC power to DC plant rectifiers; UPS; AC Maintenance
Bypass; and other power equipment.

Protected Power Distribution Service Cabinet (PPDSC) is used to distribute
UPS or Inverter "protected" power to AC loads that cannot tolerate an interruption. Never use an AC panel containing critical network loads for aisle lighting or receptacle service.

**Indicator that defines who can perform the work function on the first column of the chart above:
1. Level 4 installer (experienced with the installation of AC wiring) performs the work or licensed electrician.
2. Licensed electrician or CRE (per local agreement).

Notes:

- Network Power includes “essential" AC power to DC plant rectifiers; UPS; AC Maintenance Bypass; and other power equipment.
- CV, Non-CV is responsible to get work done. May use Level 4 installer (experienced with the installation of AC wiring), CRE suggested licensed electrician, Tier 1 Power Vendor or CRE (per local agreement).
- See Figure C-1 for Central Office Demarcation Between AC Building Power And Communications Power

2.1.3 **Tier 2 Vendors**: "AT&T Collocation Approved Installation Suppliers (Tier 2 Approved Suppliers) These suppliers have been approved to perform collocation installation work for CLECs in all 13 states of the AT&T telco central offices in the Collocator's footprint (Caged Collocation area and in the "footprint of the bay" in the Cageless (Physical) Collocation area). This category of approval does not include access to common areas, installation of cabling outside of the cage or the "footprint of the bay" in the cageless collo area, virtual collocation areas, the MDF or the BDFB power distribution areas. Tier 2 Suppliers can only coordinate a JSA/MOP for work within a Collocator's footprint. In addition, the JSA/MOP cannot include workscopes that require a Tier 1 Supplier." In order to attain Tier 2 approval a vendor is required to complete a full day “train-the-trainer” training session from the AT&T Network Planning and Engineering Quality organization.

2.1.4 **Tier 1 Vendors**: A vendor can request to be considered for approval as an AT&T Approved CO Installation Vendor (Tier 1 Vendor) by applying through AT&T Procurement Contract Management. Selection of new candidates for the Tier 1 approval process is made on an “as needed” basis by AT&T’s telcos based upon the overall AT&T telco & CLEC job volumes with the goal of maintaining enough total capacity among the Tier 1 vendors to handle the volume demand of the AT&T telcos and CLECs. Once a vendor is selected for approval trialing by an AT&T telco, the vendor is allowed to submit a firm price quote on jobs in the area/region of the AT&T telco that sponsored the vendor. The vendor must successfully complete 5 evaluation jobs in the technology category for which they have been sponsored by the AT&T telco (Power, Switch, Transmission, Batteries, Engines, etc) each job will be audited by AT&T. The job quality level shall meet AT&T’s defect quality criteria. Once the vendor has passed the job audits on the 5 jobs, the supplier will be reviewed and, if accepted by the AT&T telco review team, their company name will be added to the Tier 1 list for the technology category and the AT&T telco area/region that sponsored the vendor. A Tier 1 shall maintain an acceptable defect rate in order to retain this approval status. The list for Tier 1 Vendors is maintained by AT&T Procurement Contract Management.

2.2. Assessment of Installer Qualifications

2.2.1 Installers’ qualifications are categorized as Levels 1 through 4 as defined below. This skill level assessment is based on the installer’s years of experience in specific systems/environments and his/her ability to perform work operations/job activities associated with equipment installation activities.

2.2.2 If the Installation Supplier can demonstrate to the AT&T LEC a documented program for qualifying an installer on specific work activities and specific systems, related to the level requirements indicated below, the Installation Supplier’s rating of its personnel will be accepted. The Installation Supplier shall participate in the AT&T LEC’s supplier verification process, such as a Quality Program Analysis (QPA).

2.2.3 While the years of experience listed for an individual level is the recommended minimum for that level; advancement from one level to the next shall not be based solely on the installer's years of experience. The Installation Supplier shall assure and concur that the installer has the appropriate skills and abilities to competently progress to the next skill level before the installer performs work operations/job activities associated with a higher level.

2.2.4 All levels require a complete understanding of the equipment installation requirements and procedures associated with the work operation/job activity being performed. In addition, installers at Levels 3 and 4 require a complete and in-depth understanding of the equipment installation standards and requirements of ATT-TP-76300.

2.2.5 The Installation Supplier shall assess and classify its personnel working on telecommunications equipment by skill level on each of the following systems/environments:

a) Common Systems

b) Analog Switch

c) Digital Switch

d) Transport

e) Power Equipment

2.2.6 All Installation Supplier personnel shall carry in their possession and provide, upon request, a Skill Level Identification Card that provides identification of their skill level in each applicable system(s) for which they are qualified.

2.2.7 Once classified at a specific level on a system/environment, the installer shall perform only work operations/job activities associated with the assigned level unless properly supervised by an installer of the appropriate level.

2.2.8 A Level 3 or 4 installer shall directly supervise Level 1 and 2 installers. The in-charge or job supervisor shall be "on-site" to direct the Level 1 or 2 installers as necessary.

2.3. Skill Level Definition and Activities

2.3.1 Installers at Level 1 shall:

a) Be directly supervised and instructed by an Installation Supplier's manager or Level 3 or 4 installer

b) Be capable of performing addition or removal of non-powered or passive equipment/hardware

c) Not perform Level 2 and above work operations/job activities unless properly supervised

d) Not progress to Level 2 without a minimum of 1-1/2 years experience or documented equivalent proficiency, as determined by the Installation Supplier.

2.3.2 Installers at Level 2 shall:

a) Have a minimum of 1-1/2 years experience, or documented equivalent proficiency, as determined by the Installation Supplier

b) Be directly supervised and instructed by an Installation Supplier's manager or Level 3 or 4 installer

c) Be capable of performing the following work operations/job activities:

1. Addition or removal of non-powered or passive equipment
2. Addition or removal of wiring and connections (on non- working equipment only and switchboard cable only)
3. Lead verification

d) Not perform Level 3 or Level 4 work operations/job activities unless properly supervised

e) Not progress to Level 3 without a minimum of 4 years experience or documented equivalent proficiency, as determined by the Installation Supplier.

2.3.3 Installers at Level 3 shall:

a) Have a minimum of 4 years experience, or equivalent as determined by the Installation Supplier and demonstrated to the AT&T LEC, in the equipment system/environment (e.g. common systems, digital switch, transport, power) being worked on

b) Be capable of performing the following work operations/job activities without supervision or direction:

1. Addition or removal of common systems equipment/hardware
2. Addition or removal of wiring and connections (on non- working equipment only)
3. Lead verification
4. Analysis of job specifications and drawings
5. Provide work assignments to crew
6. Prepare the forms described in Section D and E of ATT-TP-76300
7. Resolve job specification and/or drawing problems
8. Correct office record drawings
9. In-process and final quality inspections
10. Able to communicate with the AT&T LEC on all aspects of the job throughout the duration of the job.

c) Be capable of performing as the Installation Supplier's in-charge person on jobs not specifically restricted to having a Level 4 person in charge as defined later in this section of ATT-TP-76300

d) Not perform Level 4 work operations/job activities unless properly supervised

e) Not progress to Level 4 without a minimum of 6 years experience or equivalent as determined by the Installation Supplier and demonstrated to the AT&T LEC, in the system/environment (e.g. common systems, digital switch, transport, power) being worked on

f) Not perform work operations/job activities on working equipment or circuits.

g) Job site supervision of subcontractor work.

2.3.4 Installers at Level 4 shall:

a) Have a minimum of 6 years experience, or equivalent as determined by the Installation Supplier and demonstrated to the AT&T LEC, in the equipment system/environment (e.g. common systems, digital switch, transport, power) being worked on

b) Be capable of performing the same work operations/job activities as a Level 3 installer without supervision or direction

c) Be capable of performing as the Installation Supplier's in-charge person

d) Be capable of performing additions, removals, wiring connections, and modifications on working equipment and circuits

e) Level 4 work operations/job activities may include:

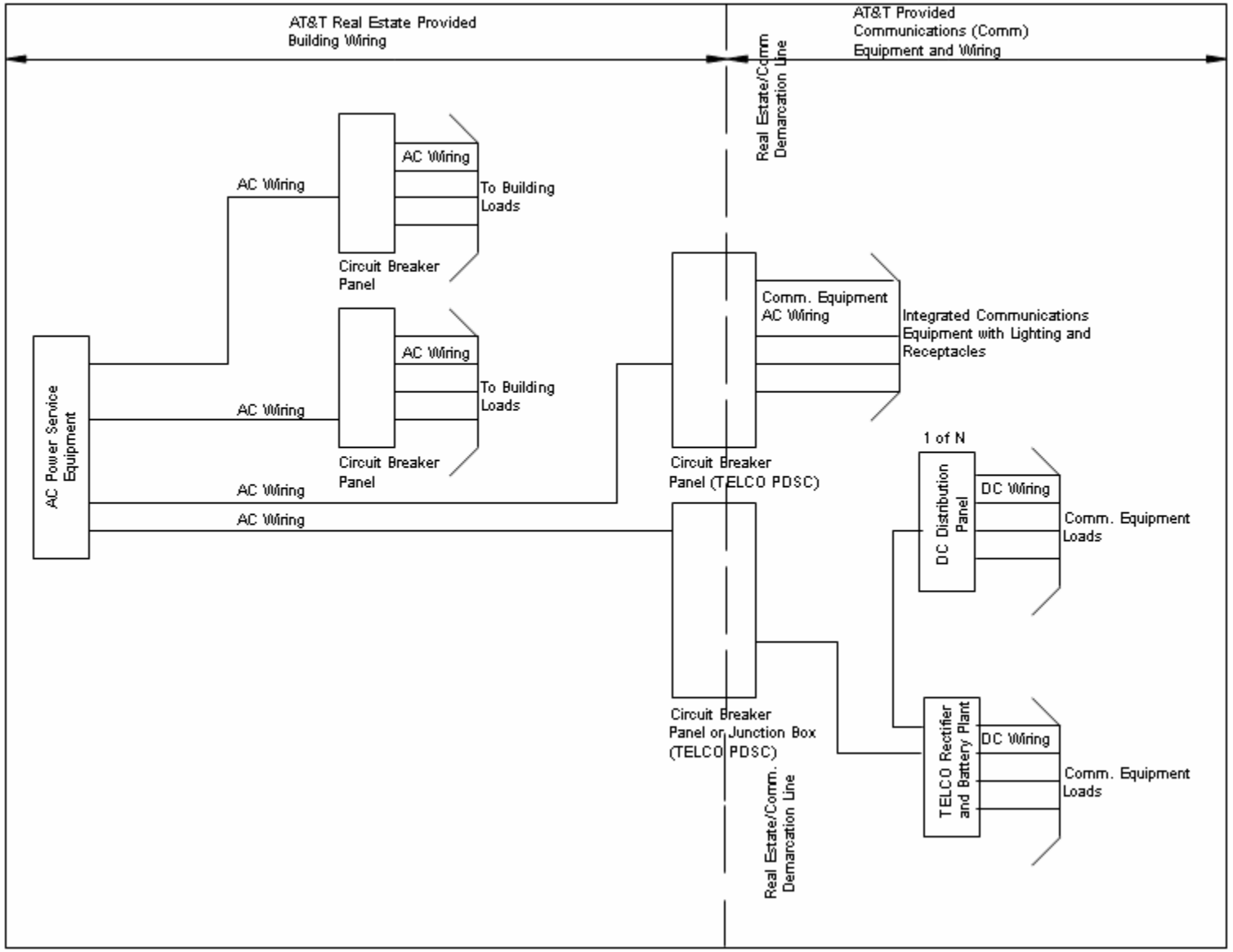
1. Circuit modifications
2. Software adds or upgrades
3. Power transition work
4. Addition or removal of batteries
5. Addition or removal of circuits on working power distribution sources
6. Equipment testing and turn-up
7. Overseeing volatile work activities
8. Job-site supervision of subcontractor work.
9. Additions, modifications, or removals to Power Boards
10. Additions, modifications, or removals to Engine Generator

TABLE C-1 – SUMMARY OF CHANGES IN SECTION C

Change	Item in 11/1/05 Issue	Item in this Issue
Revised	2-1-14	2-1-14
Deleted		
Added	2-1-2 Figure C-1	2-1-2 Figure C-1

[END OF SECTION]

Figure C-1
Central Office Demarcation Between AC Building Power And Communications Power



SECTION D – NETWORK RELIABILITY AND PROTECTION OF SERVICE

CONTENTS PAGE

1. GENERAL

1.1. Introduction

1.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all equipment added, rearranged or modified is properly installed and in conformance with AT&T LEC installation specifications.

1.1.2 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

1.1.3 Network reliability and the protection of service require full coordination and cooperation between the Installation Supplier and the AT&T LEC throughout the job. This section delineates the requirements for the Job Start Agreement (JSA) and the Method of Procedure (MOP), two important documents to facilitate job planning and coordination.

1.1.4 Changes in this issue of Section D are summarized in Table D-1.

1.1.5 If an electronic authorization is used to approve the Job Start Agreement (JSA) or Method of Procedure (MOP), a supporting email, that includes the date, TEO number and CLLI, shall also be sent by the signee to indicate that they are the person who approved the document. This email shall be attached to the JSA or MOP and then placed in the yellow wallet at job completion. The name of the individual approving the document shall be included in the signature field of the JSA or MOP along with the date of approval.

1.2. Service Interruptions

1.2.1 The Installation Supplier shall plan all work to minimize service interruptions to existing customers.

1.2.2 A service interruption is defined as any one of the following conditions:

a) Interrupts, severely impairs or denies service availability to one or more subscribers.

b) Reduces the capacity of multiple access circuits where such reduction seriously impairs completion of offered traffic through an office.

c) Interrupts or seriously impairs the proper functioning of equipment for customer billing.

d) Interrupts or impairs in any way the functioning of national security circuits or emergency service such as 911.

e) Interrupts or reduces power.

1.2.3 If an unplanned service interruption occurs, the Installation Supplier shall:

a) Cease all work activity

b) Immediately notify the appropriate personnel listed in the MOP

c) Assist in the restoration of service, at the direction of the AT&T LEC

d) Provide a written report to the AT&T LEC as directed.

2. JOB START AGREEMENT

2.1. Preparation

2.1.1 A Job Start Agreement (JSA) shall be completed and approved (signed) for every job.

2.1.2 The JSA is used to cover non-volatile (general) work activities.

2.1.3 The Job Start Agreement (JSA) shall document the start and complete dates for the job interval and serves as authorization to start a job.

2.1.4 No work activity shall begin before the actual start date and until both the AT&T LEC Representative and the Installation Supplier have signed the JSA. A verbal JSA is not acceptable.

2.1.5 The JSA shall remain current throughout the duration of the job.

2.1.6 The Installation Supplier shall complete and immediately forward the signed JSA to the AT&T LEC Equipment Engineer

2.1.7 A copy signed by both the AT&T LEC Representative and the Installation Supplier shall be available at the job site throughout the duration of the job.

2.1.8 The Installation Supplier shall negotiate the date of the JSA meeting with the AT&T LEC Representative(s).

2.1.9 The Installation Supplier shall convene the JSA meeting with the AT&T LEC Representative(s). The AT&T LEC Equipment Engineer will be responsible for determining the AT&T LEC Representative(s) for the JSA meeting, at which the job plans will be discussed and the JSA (Figure D-1) approved.

2.1.10 The JSA shall include in the General Job Description the location of the major equipment components being added, modified or removed on the job, (i.e. bay location, shelf with bay location and shelf designation, etc.).

2.1.11 At the JSA meeting, the AT&T LEC Representative(s) and Installation Supplier shall discuss all items listed on the JSA. The JSA shall be completed and signed by both the AT&T LEC Representative(s) and the Installation Supplier at least five (5) business days, unless otherwise negotiated, before start of the job.

2.1.12 At job completion, a copy of all the approved JSAs shall be included in the yellow wallet.

2.2. Revised Completion Date

2.2.1 It is recognized that, during the duration of a job, conditions arise which may have an adverse impact on the scheduled completion date. These conditions may be the responsibility of either the Installation Supplier or the AT&T LEC Equipment Engineer and include, but are not limited to, changes in the original order, damaged equipment, shipping delays, labor, engineering omissions or errors, defective software and service or safety requirements.

2.2.2 As soon as the Installation Supplier determines that the scheduled installation completion date is in jeopardy, the Installation Supplier shall contact the AT&T LEC Equipment Engineer.

2.2.3 When a new installation completion date has been negotiated between the Installation Supplier and the AT&T LEC Equipment Engineer, a revised JSA shall be issued. The specific reason for the new completion date shall be noted on the revised JSA. The revised JSA shall be checked “Revised”, signed, dated and distributed the same as the original JSA.

2.3. Post-job Job Start Agreement

2.3.1 After the Job Completion Report (see Section E of ATT-TP-76300) has been issued, the Installation Supplier shall complete a post-job Job Start Agreement if additional or corrective work associated with the original job is required. This post-job JSA shall have the “POST JOB” box checked to indicate that this is a continuation of an existing job.

2.3.2 The Installation Supplier shall forward the signed post-job JSA to the AT&T LEC Equipment Engineer and have it available at the job site.

2.3.3 At completion of the work, all approved copies of the JSA(s) shall be included in the yellow wallet.

3. METHOD OF PROCEDURE

3.1. Introduction

3.1.1 The written Method of Procedure (MOP) is the document used to detail how, when and where work activities that pose a significant risk to service are to be performed. Such work activities are called volatile work activities.

3.1.2 A MOP shall be completed for all volatile work activities being performed.

3.1.3 The AT&T LEC reserves the right to require a MOP for any work deemed by AT&T as volatile work activity.

3.1.4 The initial MOP shall be identified as MOP No. 1 in the MOP No. field. When multiple MOPs are written on a job, the MOPs shall be numbered consecutively.

3.2. Volatile Work Activities

3.2.1 The following is a list of volatile work activities that shall be conducted during the "maintenance window", normally between 10:00 PM and 6:00 AM unless otherwise directed by the AT&T LEC.

a) All activities on live power equipment that includes the addition, rearrangement or removal of power equipment, cable or terminations.

b) All activities on timing equipment that include the addition, rearrangement or removal of either the input or output leads of a timing device.

c) All software upgrades and transition activity, including integration of major equipment components, except trunks and service circuits.

d) Backplane work, shelf replacement, processor hardware activity.

e) All relocation, recabling or other rearrangements of any currently in-service equipment.

f) All relocation, recabling or other rearrangements of site specific equipment that is unique and identified as critical to service.

g) All equipment removals and cable mining jobs.

h) All other work operations on building and telecommunications equipment that are considered to pose a significant risk to service.

1. Examples would include but are not limited to:

i. Electrical Switchgear maintenance and repairs, other than infrared testing.

ii. Major Chiller teardowns, where there is no redundancy

iii. Work above Telecommunications equipment

iv. Building structural work

2. This Does not include activities such as:

i. Floor care, Infrared testing of switchgear, Lawn care, etc.

i) All cutting of installed Fiber Protection System (FPS) that contain fibers.

3.3. MOP Preparation and Use

3.3.1 The MOP requirements are determined by the job documentation (Job Specifications, Drawings etc.), complexity and technology type (e.g., switch, transport, and power).

3.3.2 Unless otherwise authorized by the AT&T LEC Representative, the Installation Supplier shall perform a walk-through at the job site with the AT&T LEC Representative to identify and address specific requirements, special conditions and potential risks to service.

3.3.3 The Installation Supplier shall list the detailed work steps associated with the volatile work activity in logical sequence.

a) The following work steps shall always be included:

1. Notify the Alarms Surveillance Center about pending work

2. Verify that no affected equipment alarm conditions exist.
3. The responsibility (Installation Supplier and/or AT&T LEC) for each work activity.
4. Protection required for the equipment
5. Location and availability of spare fuses

b) The following also shall be considered when developing a MOP (additional considerations may be necessary for unusual installations):

1. Possible service problems and restoration procedures.
2. The time the various steps will be performed and the equipment to be removed from service, including the number and schedule of circuits to be made busy.
3. The skill level of personnel performing the work outlined on the MOP.
4. Notification to collocators affected by the work activities.
5. Availability of an alternative communication link such as an FX line, etc.

3.3.4 If the Installation Supplier is authorized to perform volatile work activity that is normally performed by AT&T LEC, the responsibility shall be defined in the MOP.

3.3.5 Unless agreed upon by the AT&T LEC Representative, the MOP shall be presented for signatures at least five (5) business days before the volatile work activity is to begin.

3.3.6 At the discretion of the AT&T LEC Representative, a dry run of the installation activity plan may be held with the Installation Supplier to ensure that procedures described in the MOP match the physical layout of the system to be worked on. The Dry Run form shall be completed and signed by both the Installation Supplier and the AT&T LEC Representative.

3.3.7 Before any volatile work is performed, all persons involved in the work operation (s) covered by this MOP shall complete the ask yourself questions, check each box and sign off at the bottom, then the AT&T LEC Representative shall sign the form.

3.3.8 No volatile work activity shall begin until both the AT&T LEC REPRESENTATIVE and the Installation Supplier have signed the MOP. A verbal MOP is not acceptable.

3.3.9 A copy of the signed, approved MOP shall be available at the work site and readily accessible to Installation Supplier personnel while work is being performed.

3.3.10 The Installation Supplier shall provide a Level 4 representative on-site to oversee any MOP work performed by the Installation Supplier's personnel or non-approved subcontractors.

3.3.11 The Installation Supplier shall not deviate from the approved MOP unless authorized in writing by the AT&T LEC Representative**.**

3.3.12 The Installation Supplier shall adhere to the Safe-Stop Points (SSP), back-out procedures, and restoration procedures as detailed in the MOP.

3.3.13 The Installation Supplier shall stop the MOP activities if conditions are encountered or observed that have affected or will adversely affect service.

3.3.14 The MOP shall include adequate testing time after a transition or modification.

3.3.15 The Installation Supplier shall ensure that affected alarms have been checked both before and after installation activity for proper functioning.

3.3.16 After completing each detailed step, the Installation Supplier shall date, time and initial the step, and if on-site coverage is required, have the AT&T LEC Representative initial and date each step.

3.3.17 At job completion, a copy of all the approved MOP(s), including all the required pages, shall be placed in the yellow wallet.

4. CRITICAL POWER MOPS

4.1. A Critical Power MOP shall be provided for any of the following work activities:

a) Transitions associated with power plant replacements

b) Battery string replacements in single battery string power plants

c) Primary power rearrangements on BDFBs

d) All DC primary transition work

e) All AC work that affects the DC power plant including standby engines

f) Power plant capacity expansions

g) Shunt replacement

h) Primary bus extension/expansion

i) Other documented regional requirements

4.1.2 Critical Power MOP shall adhere to the requirements as listed in Section 3 as well as those in the following paragraphs.

4.1.3 Unless agreed upon by the AT&T LEC Representative, the MOP shall be presented for signatures at least ten (10) business days before the volatile work activity is to begin for all of the Critical Power Jobs defined above.

4.1.4 No Critical Power MOP volatile work activity shall begin until the AT&T Power Engineer, the appropriate AT&T Power Maintenance Engineer, the AT&T LEC Representative, and the Installation Supplier have signed the MOP. A verbal MOP is not acceptable.

4.1.5 A dry run of the installation activity plan shall be conducted with the AT&T LEC Representative and the Installation Supplier to ensure that procedures described in the Critical Power MOP match the physical layout of the system to be worked on.

4.1.6 The Dry Run form shall be completed and signed by both the Installation Supplier and the AT&T LEC Representative.

4.1.7 The Installation Supplier shall adhere to the Safe-Stop Points (SSP), back-out procedures, and restoration procedures as detailed in the MOP. The Safe-Stop Points shall be clearly identified in the detailed steps of the MOP.

4.1.8 The Critical Power MOP shall include detailed steps to validate the integrity of the power plant bonding and grounding before any work activity begins.

a) The Installation supplier shall report all discrepancies via a JIM to the Power Engineer for resolution before proceeding with work activities.

4.1.9 Steps shall be identified on Critical Power MOPs that require a AT&T LEC Representative to be on site and shall observe the Vendor while work is being done. The AT&T employee will monitor Critical Power MOP compliance and the completion of these steps as the work progresses.

4.1.10 After completing each detailed step, the Installation Supplier shall date, time and initial the step and have the AT&T LEC Representative initial each step.

TABLE D-1 – SUMMARY OF CHANGES IN SECTION D

Change	Item in 11/1/05 Issue	Item in this Issue
Revised	1-1-5 3-3-7	1-1-5 3-3-7
Deleted		
Added		

FIGURE D-1 – JOB START AGREEMENT

A reproducible Job Start Agreement form is provided on the following page.

JOB START AGREEMENT

Check One: ☐ Original ☐ Revised ☐ Post Job

☐ **CRITICAL POWER JOB**

This document establishes a firm work schedule for the start and completion of the job and authorizes the Installation Supplier to begin work. A MOP shall be issued before any Volatile Work Activity begins.

JOB INFORMATION:

CLLI _____ City _____ State _____

TEO No. _____ Project No. _____

Equipment Engineer _____

Installation Supplier _____ Supplier Order No. _____

TASK /FRC _____ LOC or GEO/PAR _____ Tracking Code _____
(AT&T provided)

FIRM SCHEDULE FOR WORK TO BE DONE AT THIS JOB SITE:

Actual Start Date _____ Scheduled Completion Date _____

Daily Work Schedule: Start Time _____ Stop Time _____

JOB DESCRIPTION: _____

REASON FOR REVISION: _____

Work shall not begin on this project until the designated AT&T LEC Representative properly authorizes this Job Start Agreement and the following items have been discussed:

☐ Arrangements for building access
☐ On-site coverage
☐ Equipment to be installed, removed, and/or modified
☐ In-Service equipment affected, requiring a MOP before work begins
☐ Building and/or equipment protection during installation
☐ Cable penetrations (complete Cable Penetration Reporting Log)
☐ Storage of equipment, material, and tools
☐ Environmental permits, notifications, and floor drilling training
☐ Alarm installation, cross-connection leads, and testing responsibility
☐ Target walk-through date (before or on completion date)
☐ Problem resolution contacts (immediate supervisor):

☐ Network Awareness
☐ Collocation Activity
☐ Cable Routing (Blocked, Overload)
☐ Safety considerations
☐ Specific test requirements
☐ Identify Non-approved subcontractors

Manager (LEC) _____ Tel. No. _____ Pager No. _____
NOC/STC/TTC _____ Tel No. _____ Pager No. _____
Manager (Supplier) _____ Tel No. _____ Pager No. _____

If a service interruption occurs, the Installation Supplier shall:

1. Stop all work operations immediately.
2. Notify local CO and/or ASC personnel of details immediately.
3. Not replace fuses or restore breakers without the direction of the AT&T LEC.
4. Provide a written report to the AT&T LEC as directed.

☐ Other pertinent factors unique to this project: _____

☐ **Check box if the Job Start Agreement includes attachments.**

Agreement has been reached on all items checked above. No deviations from this agreement will be allowed without the approval of the designated AT&T LEC Representative.

*AT&T LEC Rep. Signature/Title & Date

*Installation Supplier Signature/Title & Date

Other Signature (As required)/Title & Date

Other Signature (As required)/Title & Date

Installation Supplier shall distribute this completed form to:

☐ AT&T LEC Equipment Eng. ☐ Yellow wallet

☐ AT&T Power Maintenance Engineer*
*ONLY on Critical Power Jobs

FIGURE D-2 – METHOD OF PROCEDURE

Reproducible MOP forms are provided on the following pages.

METHOD OF PROCEDURE

MOP No._____

JOB INFORMATION:

CLLI _____ City _____ State _____
TEO No. _____ Project No. _____
Equipment Engineer _____
Installation Supplier _____ Supplier Order No. _____

TASK /FRC _____ LOC or GEO/PAR _____ Tracking Code _____
(AT&T provided)

MOP AUTHOR: _____
Skill Level _____ Telephone _____

GENERAL MOP DESCRIPTION:

_____

DETAILED MOP SCHEDULE:

Start Date End Date Work Hours To

AFFECTED COLLOCATORS NOTIFIED:

Yes ☐ N/A ☐

Tracking No. (AT&T LEC use)

Detailed list of equipment to be Added (A) / Removed (R) / Modified (M):
Where Volatile Work Activity is to be performed

Equipment Description	RR/Bay/PBD	Shelf/Panel	Fuse Pos.	Load A,B,C	A/R/M

List of all Handbooks, Technical Documents, Bulletins, Flashes, and Warnings related to work operations under this MOP:

Title	Issue	Title	Issue

METHOD OF PROCEDURE

MOP No._____
TEO No. _____

If a service interruption occurs, the Installation Supplier shall:

1. Cease all work operations immediately.
2. Local CO and/or ASC personnel shall be notified of outage details immediately.
3. No fuses or breakers shall be replaced or restored without the direction of the AT&T LEC.
4. Provide a written report to the AT&T LEC as directed.

List sequence for notification of service interruption or degradation

	Name/Center **(Alarm Surveillance Center (Required)**	Phone	Pager
1			
2			
3			
4			
5			

Installation Supplier Personnel working under this MOP

Name	Skill Level	Emergency No.	Name	Skill Level	Emergency No.

The Installation Supplier shall not deviate from the approved MOP unless authorized by the AT&T LEC Representative. The approved MOP shall be filed in the Yellow Wallet at the job site. Copies can be made for further distribution if requested. Asterisk (*) denotes mandatory signatures on all MOP's, (**) denotes mandatory signatures on all Critical Power MOP's. The Installation Supplier shall determine from the AT&T LEC Representative whether additional signatures are required.

MOP APPROVAL

Title	Print Name	Phone/Pager No.	Signature	Date
*AT&T LEC Rep.				
*Installation Supplier				
**AT&T LEC Equipment Eng.				
**AT&T LEC Power Maint. Eng.				
AT&T LEC Maint. Eng.				
AT&T LEC Site Manager				
Other as Required				

METHOD OF PROCEDURE

MOP No._____
TEO No. _____

When the AT&T LEC requires this page, it shall be completed and included with the previous required pages of the MOP.

DRY RUN - Required ☐ Yes ☐ No

A Step-by-Step "Dry Run" of the Volatile Work Activities listed in the "Detailed Steps" portion of this MOP has been performed by the following representative(s):

The Installation Supplier's personnel who will be performing the work activities:

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

AT&T LEC Representative and Installation Supplier responsible for the equipment/system being worked on:

*AT&T LEC Rep.
Signature: _____ Date: _____

*Installation
Supplier Signature: _____ Date: _____

Yes ☐
No ☐
N/A ☐ **(If there were changes as a result of the "Dry Run" they incorporated into a revised, signed, and approved MOP?)**

METHOD OF PROCEDURE

MOP No._____
TEO No. _____

ASK YOURSELF QUESTIONS

BEFORE ANY CRITICAL WORK IS PERFORMED, ALL PERSONS INVOLVED IN THE WORK OPERATION (S) COVERED BY THIS MOP SHALL COMPLETE THE FOLLOWING ASK YOURSELF QUESTIONS, CHECK EACH BOX AND SIGN OFF AT THE BOTTOM.

Check Box

Yes	No	
☐	☐	1. DO I HAVE THE PROPER ID AND APPROPRIATE BUILDING ACCESS PERMISSIONS TO THE ENVIRONMENT I AM ABOUT TO ENTER? I am responsible for the security and safety of this work environment. Wearing two ID badges, one contractor and one AT&T, will be strictly enforced at all times.
☐	☐	2. DO I KNOW WHY I AM DOING THIS WORK? I am responsible for the work that is being performed. It is critical that I have a clear understanding of what work is being performed and why and it is essential to ask questions.
☐	☐	3. HAVE I IDENTIFIED AND NOTIFIED EVERYBODY-CUSTOMERS AND INTERNAL GROUPS-WHO WILL BE DIRECTLY AFFECTED BY THIS WORK? It is important to over communicate rather than under communicate in these situations. Do I have up to date phone and contact lists? In addition, have I used any applicable critical event notification processes, which may apply in these situations?
☐	☐	4. CAN I PREVENT OR CONTROL SERVICE INTERRUPTIONS? It is critical to know the potential impact of the work steps being performed and to understand how the equipment being worked on is used by our customers.
☐	☐	5. IS THIS THE RIGHT TIME TO DO THE WORK? Each of us must ask ourselves this question before we undertake any work activity that could adversely affect our network. Doing the right work at the right time would allow me to minimize the disruption to the network and our customers, should I have a problem.
☐	☐	6. AM I TRAINED AND QUALIFIED TO DO THIS WORK? Training could have been received in a formal classroom setting or it could have been received from my supervisor or peers. What is important is that I have the training and that I feel confident doing the work before entering into the work operation.

METHOD OF PROCEDURE

MOP No._____
TEO No. _____

☐ ☐ 7. HAVE I CONSIDERED ALL THE INSTALLATION AND MAINTENANCE REQUIREMENTS THAT APPLY TO THIS PROCEDURE?
I can find these requirements in a number of sources, such as the ATT-TP-76300, the JSA and/or MOP and the BSP's, which are required to be on the job site. In addition, of course I can always refer to the manufacturers' technical documentation.

☐ ☐ 8. ARE THE WORK ORDERS, JSA and/or MOP AND SUPPORTING DOCUMENTATION DETAILED, CURRENT, ERROR FREE AND APPROPRIATELY APPROVED?
It is necessary to have accurate information, and required approvals to ensure that the work activity can progress and to ensure customer service is not impacted.

☐ ☐ 9. DO I HAVE EVERYTHING I NEED TO QUICKLY BACK OUT OR RESTORE SERVICE IF SOMETHING GOES WRONG AND DO I KNOW WHOM TO CALL?
I have back out procedures and I understand the procedures should something go wrong. I have the necessary equipment on-hand to assist me in the back out procedures. The contact telephone numbers for Technical Support or ESAC are available and I have a contingency plan should the back out procedure fail."

☐ ☐ 10. HAVE I WALKED THROUGH AND DO I UNDERSTAND THE PROCEDURE?
I have a signed and approved MOP, but people who are executing the work may not understand the procedure. If any unusual situation occurred, they could react inappropriately and they may cause a service interruption. A walkthrough is critical to ensure Network health and personnel safety.

---

*AT&T LEC Rep. Signature: _____ Date: _____

*Installation Supplier Signature: _____ Date: _____

*Installation Supplier Signature: _____ Date: _____

*Installation Supplier Signature: _____ Date: _____

*Installation Supplier Signature: _____ Date: _____

METHOD OF PROCEDURE

MOP No._____
TEO No. _____

THE DETAILED STEPS OF THE WORK OPERATION SHALL BE LISTED AND COMPLETED SEQUENTIALLY:

DETAILED STEPS

RESPONSIBILITY | STEPS COMPLETED

Step No.	Supplier	AT&T LEC	*SSP	Description of Volatile Work Activities	Date	Time	Supplier	**AT&T LEC

INITIALS

*** (SSP) Safe Stop Point**

**** If on-site coverage provided**

Use additional pages if required to list detailed steps. MOP shall also include relevant attachments.

Are there attachments to this MOP: Yes ☐ No ☐

(END OF SECTION)

SECTION E -- JOB DOCUMENTATION

CONTENTS PAGE

1. GENERAL

1.1. Introduction

1.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all equipment added, rearranged or modified is properly installed and in conformance with AT&T LEC installation specifications.

1.1.2 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

1.1.3 This section covers the preparation and use of required documentation of the job.

1.1.4 Changes in this issue of Section E of ATT-TP-76300 are summarized in Table E-1.

1.2. General Requirements

1.2.1 The Installation Supplier shall use the current version of all forms, unless the AT&T LEC authorizes the use of surplus stock forms.

1.2.2 The Installation Supplier shall fill out all the forms in their entirety, including the yellow wallet label.

1.2.3 The Installation Supplier shall fill out all the forms accurately, including the yellow wallet label.

1.2.4 The Installation Supplier shall ensure the AT&T LEC Equipment Engineer or the AT&T LEC Representative signs all the forms where a signature is listed on a form or note refusal of signature of AT&T.

2. YELLOW WALLET AND LABEL

2.1. General

2.1.1 The Installation Supplier shall provide the yellow wallet for the job. The yellow wallet is a standard accordion folder with cover, minimum size 9" X 12", in which job documentation to remain at the site shall be filed.

2.1.2 The Installation Supplier shall complete a yellow wallet label, Figure E-1, and attach it on the outside cover of the yellow wallet.

2.1.3 The yellow wallet and all required documents therein shall remain at the job site at all times.

2.1.4 The Installation Supplier shall turn over to the AT&T LEC Representative all technical manuals, practices, and drawings received with the equipment as specified in the contract.

2.1.5 The Installation Supplier shall leave a complete copy of the detail specifications, all office drawings (i.e. Tab/DB, floor plan, Framemate etc.) as well as a copy of all job forms, in the yellow wallet.

2.1.6 The Installation Supplier should ensure that an AT&T LEC Representative signs the yellow wallet label.

2.1.7 The Yellow Wallet is the property of the AT&T LEC and shall be turned over to the AT&T LEC Representative upon completion of the job. This Requirement is valid for all equipment installations in an AT&T office, including CLEC equipment installations.

2.1.8 The yellow wallet shall be left at the designated AT&T location at job completion.

3. CABLE PENETRATION REPORTING LOG

3.1. General

3.1.1 The Installation Supplier shall complete the Cable Penetration Reporting Log (Figure E-2) to document the cable penetration activity.

3.1.2 At the Job Start Agreement meeting, the Installation Supplier shall provide a list of the cable penetrations to be opened during the job and attached to the JSA.

3.1.3 The Installation Supplier shall record all cable penetrations that have been accessed during that day.

3.1.4 The Cable Penetration Reporting Log shall be placed in the yellow wallet at the completion of the job and shall remain attached to the JSA..

4. BDFB LOAD DEMAND WORKSHEET

4.1. General

4.1.1 The Installation Supplier shall record BDFB load readings on the BDFB Load Demand Worksheet, and forward the worksheet to the AT&T LEC Equipment Engineer (Implementation Engineer) and Power Engineers on all jobs that add a power load to a BDFB. This includes jobs that add load to the BDFB via an existing bay fuse panel and/or circuit additions to the BDFB. The Power Engineer's approval is required prior to adding new circuit fuse positions at the BDFB. Power Engineer approval is not required when adding load via an existing bay fuse panel; however, the BDFB LDW shall still be completed and sent to the Power Engineer and AT&T LEC Equipment Engineer. Instructions and worksheets are available on Woodduck and the extranet.

4.1.2 The Installation Supplier shall file one copy of all approved/non-approved, and those (with an indicator in the Existing Bay Fuse Load Addition Box) “not requiring approval” BDFB Load Demand worksheets in the yellow wallet job folder

5. JOB INFORMATION MEMORANDUM

5.1. General

5.1.1 The Installation Supplier shall use the Job Information Memorandum (JIM) as a notification for additional information or for record purposes.

5.1.2 The JIM (Figure E-3) shall be used for those occasions when formal communications between the AT&T LEC Equipment Engineer and Installation Supplier are necessary, including, but not limited to the following:

a) Additional material

b) Additional engineering

c) A change in the TEO or detail specification

d) Additional information

e) Request for additional Installation Supplier effort

f) Request for disposition of AT&T LEC material

g) Approved deviation from AT&T LEC standards on a per job basis

h) Document verbal agreements between the Installation Supplier and the AT&T LEC.

5.1.3 The Installation Supplier shall not request from the AT&T LEC Equipment Engineer any variances from the requirements outlined in this document related to firestopping and safety issues.

5.1.4 The Installation Supplier shall forward a copy of the JIM to the recipient and place a copy in the yellow wallet.

6. TEST RECORD

6.1. Equipment Tests

6.1.1 As an integral part of the installation, the Installation Supplier shall perform tests, in accordance with the AT&T LEC testing requirements, as stated in ATT-TP-76900, to:

a) Test and verify all features and functions of the equipment provided, rearranged and/or modified to ensure that it is properly powered and it will operate properly when placed in service.

b) Ensure correct termination of all cable conductors and wiring by performing continuity tests.

c) Ensure that all required alarms work properly and are received at the local (If applicable) and remote alarm monitoring station. Responsibility for the testing of all required telemetry alarms (from Network Element to Alarm Surveillance Center) shall reside with the Installation Supplier of any element being added to the network or connecting to a power source (BDFB, Power Distribution Unit (PDU), Hendry fuse panel, etc.). Alarm requirements are specified by ATT-TP-76900. The Installation Supplier shall coordinate with the AT&T LEC Representative for required alarm cross-connection assignments.

d) In situations of pre-provisioned or empty chassis/shelf installations where common plug-in modules are not provided as part of the installation, discrete or serial alarms (both local and remote) shall be wired and tested as per this section. Other remote alarm protocols, such as TL1 or SNMP cannot be fully tested to the Alarm Surveillance Center without the common plug-in modules, therefore, any and all cabling required in the TEO for these alarm types shall be verified for correct and complete continuity from the network element to the appropriate termination point.

e) The results of all remote alarm tests shall be recorded on the Remote Alarm Test Record, (Figure E-7).

f) The Remote Alarm Test Record shall be placed in the yellow wallet at the completion of the job.

6.2. Preparation and Distribution

6.2.1 The Installation Supplier shall maintain and complete a Test Record (Figure E-4) of the tests and inspections performed during the installation. All test results shall be recorded on the Test Record as the tests are completed.

6.2.2 If trouble is found it shall be recorded, listing the location of the circuit, failure that was indicated, the trouble found and the location of the trouble.

6.2.3 When the trouble is cleared, the Installation Supplier shall initial the "Tested By" column to indicate the trouble has been cleared.

6.2.4 If the equipment is determined to be free of trouble, the Installation Supplier shall record the letters "NTF" indicating No Trouble Found, in the "Trouble Found" column and enter initials and date in the "Tested By" column to validate that the test was performed and completed satisfactorily.

6.2.5 The approved Test Record shall be placed in the yellow wallet.

7. MATERIAL DISPOSITION RECORD

7.1. General

7.1.1 The Material Disposition Record (MDR) shall be used to record the transfer of tangible items from the Installation Supplier to the AT&T LEC or Cluster Vendor (TAB/db corrected drawings). Turned-over items are listed on the MDR (Figure E-5) by the Installation Supplier and accepted by the AT&T LEC Representative.

7.1.2 Removed equipment classified as reuse, salvage, junk and any hazardous or regulated material generated during installation shall be reported on a separate MDR.

7.1.3 The Installation Supplier shall be liable for those items that have not been turned over to AT&T LEC.

7.1.4 Copies of all MDRS shall be left in the job site yellow wallet.

7.2. Purpose

7.2.1 Examples of tangible items that shall be turned over using an MDR are:

a) Office and equipment drawings

b) Handbooks and pamphlets

c) Spare circuit packs/plug-ins

d) Test Sets/accessories

e) Hand tools

f) Maintenance kits

g) Equipment not installed

h) Scrap cable and wire

i) Generic documentation

j) Jumper wire

k) Marked drawings

l) Corrected specifications

m) Corrected equipment order.

n) Floor tile drilling waste

o) Excess or spare material purchased by AT&T

7.2.2 Only one type of item shall be listed per line on the MDR.

8. JOB COMPLETION REPORT

8.1. Purpose

8.1.1 The properly authorized Job Completion Report (Figure E-6) serves as notification from the Installation Supplier that the job has been completed.

8.2. Job Completion Requirements

8.2.1 The Installation Supplier shall consider the job complete when all items described below have been complied with:

a) All equipment (i.e., bays, frames, circuits, etc.) specified in the detail specification(s) has been completely wired, adjusted, tightened, labeled or stenciled, tested or removed and is ready for service without exception.

b) An Installation Supplier quality performance audit of the installation has been completed; results of the audit documented in the yellow wallet, and written documentation that all defects and/or discrepancies have been corrected. This includes when the defect was corrected and who corrected the defect.

c) Spare parts (e.g., circuit packs, fuses, etc.) have been turned over to the AT&T LEC and are in good working condition.

NOTE: Circuit packs shall be stored in the original protective shipping cartons to reduce the possibility of ESD damage.

d) Damage to buildings and grounds (e.g., walls, floors, driveways, fences, etc.) have been corrected.

e) Correction of Installation Supplier caused defects or damage to existing equipment.

f) Removal of temporary floor, wall and column protection placed by Installation Supplier.

g) Removal of Installation Supplier's installation tools, surplus/excess equipment, excess material, trash and all other property.

h) All associated installation documentation, along with the detail specification(s) and the TEO, has been turned over to the AT&T LEC Representative in the yellow wallet.

i) All removed or equipment not installed and/or material has been disposed of per detail specification(s) or AT&T LEC equipment engineer's written instructions.

j) Copies of all Job Start Agreements, MOPs, JIMs, Marked Prints, MDRs and Job Completion Reports, etc., have been distributed as required.

k) The Installation Supplier shall notify the AT&T LEC a minimum of 5 days prior to test and acceptance.

l) The Installation Supplier shall electronically submit to the AT&T LEC Installation Quality organization no later than the fifth calendar day of the month a list of all the jobs that were completed the previous month and meet all the requirements as stated in Section E, 8.2.1, subparagraphs a-k. The submittal shall be in the form of an Excel spreadsheet.

8.3. Job Completion Report Procedure

8.3.1 The Installation Supplier shall follow these job completion steps in order:

a) Prepare and sign the Job Completion Report

b) Per 8.2.1 (L) List the job as complete on the Excel spreadsheet that is a list of jobs that were completed the previous month and forward to the Regional quality Organization.

c) Notify the AT&T LEC Equipment Engineer or AT&T LEC Representative, as determined at the JSA meeting, of the completion of installation and request a job completion walk-through meeting at the job site, prior to the scheduled complete date of the job. The Installation Supplier shall provide a Job Completion Report at the start of the job completion walk-through meeting.

d) The AT&T LEC Equipment Engineer or AT&T LEC Representative and the Installation Supplier shall conduct a formal job completion walk-through during which a complete review of all details of the project will be performed. The intent of this review is to verify all work items outlined in the job specification were completed and installed according to ATT-TP-76300 and all equipment added and/or modified is both operational and functional.

e) At the completion of the walk-through, the AT&T LEC Equipment Engineer or AT&T LEC Representative will either note the job as "Complete" or "Not Complete" and require the Installation Supplier to correct all defects or deviations from the specification as noted in the job completion walk-through. The job will not be noted as "Complete" until it is properly installed.

f) When the AT&T LEC Equipment Engineer or AT&T LEC Representative determines that the job has been completed he/she will sign the Job Completion Report.

g) The Installation Supplier shall distribute the Job Completion Report as indicated on the form.

TABLE E-1 – SUMMARY OF CHANGES IN SECTION E

Change	Item in 11/1/05 Issue	Item in this issue
Revised	2.1.5 6.1.1	2.1.5 6.1.1
Deleted		
Added		

FIGURE E-1 – LABEL FOR JOB FOLDER (YELLOW WALLET)

_____ of _____

ATTENTION AT&T CENTRAL OFFICE PERSONNEL – Retain this wallet with all its contents (Documents, Drawings, Etc.) at the job site for 180 days after completion.

OFFICE: **CITY/STATE:**

AT&T LEC NO: **PROJECT NO:**

SUPPLIER: **SUPPLIER ORDER NO:**

AT&T LEC EQUIPMENT ENGR:

JOB COMPLETION DATE: **COMPLETION WALK-THROUGH DATE:**

JOB DESCRIPTION:

The following items shall be included in yellow wallet upon completion when applicable (please √ appropriate box):

□ Job Start Agreement (JSA)
□ Method of Procedure (MOP)
□ Copy of SPEC
□ Copy of Drawings
□ Test Record
□ Job Completion Report
□ Storage Battery Charge Report
□ Cable Penetration Reporting Log
□ Internal Audit Documentation
□ Other – JIM, EIU, ETC:
□ NEA Floor Drilling Form
□ TEO

□ Material Disposition Record (MDR)
MDR # _____ listing office drawings and tangible items left in C.O.
MDR # _____ listing corrected drawings distributed per SPEC/Equipment Engineer
MDR # _____ disposition of asbestos or presumed to contain asbestos residue

□ BDFB Load Demand Worksheet
□ DC Distribution Worksheet
□ Remote Alarm Test Record
□ New BDFB WORKSHEET

SUPPLIER:

Signature
DATE:

AT&T REP:

Signature (Ensure all required documentation is enclosed)
DATE:

THIS WALLET IS THE PROPERTY OF THE AT&T LEC WHEN TURNED OVER TO THE AT&T LEC REPRESENTATIVE AT THE TIME OF JOB COMPLETION.

FIGURE E-2 – CABLE PENETRATION REPORTING LOG

A reproducible copy of the Cable Penetration Reporting Log form is provided on the following page.

JOB INFORMATION:

CLLI _____City _____ State_____

LEC TEO/CON No _____ Project No _____

LEC Equipment Engineer _____

Installation Supplier _____ Supplier Order No _____

CABLE PENETRATION REPORTING LOG:

List all affected cable penetrations to be closed as required in ATT-TP-76300:

CABLE PENETRATION LOCATION/ID	DATE OPENED	DATE CLOSED

FIGURE E-3 – JOB INFORMATION MEMORANDUM

A reproducible copy of the Job Information Memorandum (JIM) form is provided on the next page.

JOB INFORMATION:

CLLI _____ City _____ State_____
LEC TEO/CON No _____ Project No _____
LEC Equipment Engineer _____
Installation Supplier _____ Supplier Order No _____

JIM NO. _____

TO _____	FROM _____
ADDR. _____	ADDR. _____
CITY _____	CITY _____
PHONE _____	PHONE _____

JOB DESCRIPTION _____

SUBJECT _____

DETAILS _____

_____

_____

_____

_____

_____

_____

_____

ORIGINATOR _____ TITLE _____

SIGNATURE _____ DATE _____

RESPONSE _____

_____

_____

NAME _____ TITLE _____

SIGNATURE _____ DATE _____

Distribution: Yellow Wallet **AT&T LEC Equipment Engineer**

FIGURE E-4 - TEST RECORD

A reproducible copy of the Test Record form is provided on the following page.

JOB INFORMATION:

CLLI _____ City _____ State_____
LEC TEO/CON No _____ Project No _____
LEC Equipment Engineer _____
Installation Supplier _____ Supplier Order No _____

LIST ALL TESTS PERFORMED

BAY SHELF PANEL	CIRCUIT NUMBER	DESCRIPTION OF TEST PERFORMED	DESCRIPTION OF TROUBLE FOUND OR "NTF"	TESTED BY & DATE

All Alarms associated with the above listed equipment were tested in accordance with ATT-TP-76900

ATTACHMENTS

SUPPLIER APPROVAL:

THE ABOVE TEST(S) HAVE BEEN PERFORMED AND ALL TROUBLE FOUND HAS BEEN CLEARED.

_____ _____
SUPPLIER'S SIGNATURE DATE

LEC ACCEPTANCE: THE APPROVED TEST RECORD SHALL BE FILED IN THE YELLOW WALLET AT THE JOB SITE. COPIES CAN BE MADE FOR FURTHER DISTRIBUTION IF REQUESTED.
AT THE COMPLETION / ACCEPTANCE WALK-THROUGH, THE ABOVE LIST OF TEST(S) WAS VERIFIED TO BE A COMPLETE LIST OF TESTS REQUIRED FOR THIS JOB.

_____ _____
LEC REPRESENTATIVE DATE

FIGURE E-5 – MATERIAL DISPOSITION RECORD

A reproducible copy of the Material Disposition Record form is provided on the following page.

MATERIAL DISPOSITION RECORD
AT&T Local Exchange Carriers

Reference: ATT-TP-76300
March 31, 2007

JOB INFORMATION:
CLLI _____ City _____ State_____
LEC TEO/CON No _____ Project No _____
LEC Equipment Engineer _____
Installation Supplier _____ Supplier Order No _____

MDR Number: _____ Page: _____ of _____

TO:
Location: _____ Attention: _____
Address: _____ City, State, ZIP: _____

FROM:
Address: _____ City, State, ZIP:_____

Quantity	Material Name and Description	Corrected Drawing	Spec/PO	Item

Office Drawings
Equipment Manuals
Ckt Packs/Plug-ins
Corrected Drwgs Yes No
Test Set/Accessories
Other (Explain in Remarks)

Distribute to:
LEC Equipment Engineer
Yellow Wallet
Shipment from Job Site

Remarks: _____
_____
_____
Job Completion Date: _____
Supplier Signature: _____ Date: _____

Received:
LEC Representative: _____ Date: _____

LEC Equipment Engineer: _____ Date: _____

FIGURE E-6 – JOB COMPLETION REPORT

A reproducible copy of the Job Completion Report form is provided on the following page.

JOB COMPLETION REPORT
AT&T Local Exchange Carriers

Reference: ATT-TP-76300
March 31, 2007

☐ Advance
☐ Final

JOB INFORMATION:

CLLI _____ City _____ State_____
LEC TEO/CON No _____ Project No _____
LEC Equipment Engineer _____
Installation Supplier _____ Supplier Order No _____

After proper authorization, this document serves as notification from the Installation Supplier of job completion.

Actual Job Completion Date: _____

Project Description _____
_____
_
_____
_

The following individuals were present and participated in the final job review:

Name	Title
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

YES / NO All equipment ordered in the above specification has been provided and/or installed, without exception, in accordance with the current ATT-TP-76300 and is ready for service.
(NOTE: Even if there are exceptions, this job is subject to AT&T LEC quality audits.)

If **NO** is circled, list the exceptions below, and reschedule the job completion by issuing a revised Job Start Agreement.

_____
_____
_____
_____
_____
_____
_____

_____	_____	_____
Installation Supplier Representative (Sig)	Title	Date
_____	_____	_____
LEC Representative (Sig)	Title	Date

This completed form (whether **YES** or **NO** is circled) shall be distributed to:
AT&T LEC Equipment Engineer
Yellow wallet

FIGURE E-7 – REMOTE ALARM TEST RECORD REPORT

A reproducible copy of the Remote Alarm Test Record Report form is provided on the following page.

JOB INFORMATION:

CLLI ________________________________ City ___________________________ State_______________
LEC TEO/CON No _______________________ Project No ____
LEC Equipment Engineer ____
Installation Supplier __________________________________ Supplier Order No ________________________

LIST ALL REMOTE ALARM TESTS PERFORMED

TEST DATE	EQUIP. TYPE	R.R. / BAY SHELF	ALARM DESCRIP	DISPLAY # POINT #	ALARM TYPE	TESTED BY
				Disp #: Pt #:	☐ Discrete/TBOS ☐ TL1 Msg.	
				Disp #: Pt #:	☐ Discrete/TBOS ☐ TL1 Msg.	
				Disp #: Pt #:	☐ Discrete/TBOS ☐ TL1 Msg.	
				Disp #: Pt #:	☐ Discrete/TBOS ☐ TL1 Msg.	
				Disp #: Pt #:	☐ Discrete/TBOS ☐ TL1 Msg.	
				Disp #: Pt #:	☐ Discrete/TBOS ☐ TL1 Msg.	
				Disp #: Pt #:	☐ Discrete/TBOS ☐ TL1 Msg.	
				Disp #: Pt #:	☐ Discrete/TBOS ☐ TL1 Msg.	
				Disp #: Pt #:	☐ Discrete/TBOS ☐ TL1 Msg.	
				Disp #: Pt #:	☐ Discrete/TBOS ☐ TL1 Msg.	
				Disp #: Pt #:	☐ Discrete/TBOS ☐ TL1 Msg.	
				Disp #: Pt #:	☐ Discrete/TBOS ☐ TL1 Msg.	
				Disp #: Pt #:	☐ Discrete/TBOS ☐ TL1 Msg.	
				Disp #: Pt #:	☐ Discrete/TBOS ☐ TL1 Msg.	
				Disp #: Pt #:	☐ Discrete/TBOS ☐ TL1 Msg.	
				Disp #: Pt #:	☐ Discrete/TBOS ☐ TL1 Msg.	
				Disp #: Pt #:	☐ Discrete/TBOS ☐ TL1 Msg.	
				Disp #: Pt #:	☐ Discrete/TBOS ☐ TL1 Msg.	

☐ **ATTACHMENTS**

INSTALLATION SUPPLIER: THE ABOVE ALARMS HAVE BEEN TESTED FROM THE NETWORK ELEMENT TO THE NOC AND ALL TROUBLE FOUND HAS BEEN CLEARED.

____ ____________________
SUPPLIER'S SIGNATURE DATE

LEC ACCEPTANCE: THE APPROVED TEST RECORD SHALL BE FILED IN THE YELLOW WALLET AT THE JOB SITE. COPIES CAN BE MADE FOR FURTHER DISTRIBUTION IF REQUESTED. AT THE COMPLETION / ACCEPTANCE WALK-THROUGH, THE ABOVE LIST OF TEST(S) WAS VERIFIED TO BE A COMPLETE LIST OF TESTS REQUIRED FOR THIS JOB.

____ ____________________
AT&T LEC REPRESENTATIVE DATE

[END OF SECTION]

SECTION F-- FIRE STOPPING

CONTENTS PAGE

1. GENERAL

1.1. Introduction

1.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all equipment added, rearranged or modified is properly installed and in conformance with AT&T LEC installation specifications.

1.1.2 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

1.1.3 This section covers the general requirements for opening and closing through-penetrations in floors and fire rated walls and protection of cable runs.

1.1.4 Changes in this issue of Section F are summarized in Table F-1.

2. REQUIREMENTS

2.1. General

2.1.1 Smoke and fire stopping is required at all through-penetrations in floors and fire rated walls.

A: Through-penetrations in non-fire rated walls shall not be fire stopped.

B: The Installation Supplier shall contact the AT&T LEC Equipment Engineer for questions regarding the fire rating of a specific wall. This information shall be documented on a JIM and a copy left in the yellow wallet.

2.1.2 Fire-stopping products made by different manufacturers shall not be used in the same cable hole or through-penetration. The exception to this requirement applies to smoke stopping at the interior of cable bundles. It is acceptable to fire stop a through-penetration with a product furnished by a supplier other than that which is/was used to smoke stop the interior of the cable bundle.

2.1.3 When the Installation Supplier opens a cable hole, the Installation Supplier shall close and fire-stop the cable hole in accordance with this section.

2.1.4 The Installation Supplier shall comply with the following fire stop management considerations:

a) The Installation Supplier shall permanently close through penetrations at the end of each workday or at the completion of an installation or removal operation, whichever occurs first.

b) The Installation Supplier shall update the Cable Penetration Reporting Log (see Section E).

c) The installation Supplier shall not leave the premises while a through-penetration is open.

d) Unframed cable holes in hollow walls shall be referred to the AT&T LEC Equipment Engineer for upgrading so holes are framed on all four sides. Any supporting documentation regarding this issue shall be left in the yellow wallet.

2.1.5 All penetrations shall be closed with Hilti fire stop materials and smoke stop putty in accordance to Hilti approved systems. Exceptions to this policy will be limited to the following:

a) Existing penetrations with other than Hilti materials may continue to be fire and smoke stopped with existing systems until those penetrations are opened in the future.

b) Cable penetration opened for inspection and immediately closed with no cable add or removal.

c) Closure of penetration during course of project when work in a penetration has not been completed. Final closure of penetration will be fire and smoke stopped with Hilti materials.

d) Cable penetrations previously closed using other fire stopping system shall have all existing materials removed and replaced with Hilti materials. Smoke stop putty of another manufacturer that is not accessible internal to the opening or between cable bundle may be left in place.

3M fire and smoke stopping procedures in this document describe previously used methods and paragraphs are presented solely for purposes of assuring those remaining openings are in compliance to those methods

2.1.6 If technical assistance is required for non-standard cable hole penetrations, the Installation Supplier shall complete the Request for Technical Assistance form at the end of this Section and forward as indicated on the form. When this form is used, a copy of the response from AT&T shall be left in the yellow wallet at job completion.

2.1.7 Conduits and pipes shall not be added to through-penetrations containing network interconnection cables. Conduit and pipes shall be run through a separate opening, which shall be fire stopped with approved intumescent products. Refer to paragraphs 4.7 to 4.10 of this section for more information.

2.1.8 Through-penetration covers shall be removed before installing new cable and removing dead cable. Cable(s) and conduit shall not be pushed or pulled through an opening without the removal of the cable hole covers.

2.1.9 The Installation Supplier shall provide adequate protection for open cable holes to protect personnel and equipment where there is danger of material or personnel falling through the cable opening. This may include barricades, warning signs and mechanical protection.

2.1.10 The Installation Supplier shall ensure that all surfaces are clean and free of dust, grease, oil, loose materials, rust, or other substances, prior to applying intumescent putty or caulk.

2.1.11 The Installation Supplier shall ensure that fire stopping products are prepared and used in accordance with the manufacturer's documentation before installation.

2.1.12 The edges of cut intumescent composite sheets and cable hole cover plates shall be deburred and free of sharp corners.

a) The corners of composite sheets and cable hole covers shall be rounded to an 1/8-inch minimum radius.

2.1.13 The cover plate and intumescent composite sheets shall not extend beyond the edge of the corners of the cable hole sheathings at floor openings.

2.1.14 Multipiece cable hole covers shall be spliced together in the following manner:

a) A 2 inch wide 28 gauge galvanized steel splice strip shall be used to join the two pieces together. A splice strip shall not be multi-piece. It shall be of one continuous length.

b) The splice strips shall be secured with ¼ inch by ½ inch sheet metal screws spaced at a maximum of 3 inches apart starting from each end.

c) 1-¼ inch fender washers shall be used under the screw heads located on the outer edge of the cable hole perimeter.

d) Intumescent putty shall be placed under the splice strip filling the seam between adjacent pieces of composite sheets and adjacent pieces of covers at floor openings

e) Multiple small pieces shall not be spliced together to form one large piece.

2.1.15 Refer to figure F-50 for general guidelines for fire stopping adjacent wall building constructions.

3. GENERAL

3.1. Smoke Stoppage Associated with Cable Installation

3.1.1 During cable installation, smoke stopping shall be achieved by filling the interior voids between the cables being installed with approved non-hardening intumescent putty as described below and shown in the appropriate figures in this section.

a) Smoke stopping is required on both sides of hollow wall penetrations that are not equipped with metallic sleeves or are not framed on all four sides.

b) Smoke stopping for solid wall and four sided framed hollow wall applications shall be applied on the side of the wall providing the greatest ease of installation, preferably the network equipment side.

c) The ends of all conduits, pipes, tubing, etc. used for routing cable and wire through fire rated walls and floors that do not terminate in an enclosure, shall be sealed with a minimum of 1/4" depth of intumescent putty or 1" minimum depth of Hilti fire block material.

d) Smoke stopping shall be applied to all cables restored to cable racks after cable removal/mining activity.

3.1.2 Mini-coax cables shall be bundled together and treated as a single cable. They shall be fire stopped as follows:

a) Each individual coax cable shall not be individually wrapped with an intumescent putty pad.

b) Intumescent putty or caulk shall be placed into the middle of the cable bundle to fill all of the void space between the coax cables.

c) The banded mini-coax bundle shall be treated as a single cable and fire stop per requirements found in the rest of Section F.

3.1.3 After installing cables and applying smoke stopping material between the cables, the Installation Supplier shall tightly band cables together to compress the cable bundle and effectively join smoke stopping material to form an airtight seal. (See Figure F-2).

a) Cable bands shall be a 1/4-inch or larger nylon cable tie (preferred) or a minimum of 4 strands of 9-ply wax fiber cord.

b) Cable bands shall be placed 1 ½ to 2 inches above the top cable hole cover and shall be visible for inspection when the last securing strap is more than six inches from the cable hole cover.

c) Cable bands shall be placed 1 ½ to 2 inches below the bottom side cable hole opening and shall be visible for inspection when the first securing strap is more than six inches from the cable hole opening

d) The locking head of the cable tie shall be positioned at the side or rear of the cable rack..

e) Cable protection practices may require wrapping some cable types with protective sheeting such as fiber paper before they are banded together. Refer to Section J of this document.

3.2. Smoke Stopping For Cable Holes Closed With 3M Products

3.2.1 The Installation Supplier shall apply a minimum of 2 linear inches of intumescent putty between the last existing layer and any new cables during installation so that all voids and valleys between adjacent cables are effectively filled to achieve an air tight seal.

a) The putty shall be applied in rope form filling the interior cable voids. To avoid unnecessary buildup of cable bundles, the vendor shall not wrap each individual cable with a putty strip.

b) A minimum of two inches of putty shall be placed so that it extends at least 1-inch above the cable hole cover and 1-inch below the cover into the opening.

3.3 Smoke Stopping For Cable Holes Closed With Hilti Products

3.3.1 Cable openings and cable bundles shall be smoke stopped as follows;

a) A single layer of minimum 1-inch wide putty pad material shall be firmly applied across the face of opening where cables will rest against the building surface. This layer of material shall be minimally as wide as the opening's cable rack(s) and extend 1 inch above/from the building surface. The portion of material extending above/from the building surface shall be pressed into the cable curvatures as cable is placed across the face of the opening in their final installed position.

b) A single layer of minimum 1-inch wide putty pad material shall be firmly applied across each layer of cable in a manner that fills the voids between the cables to form an air tight seal.

c) All layered smoke stopping material shall extend a minimum of 1 inch into floor and wall openings. Adjacent segments of layered material shall overlap a minimum of ¼ inch

4. FIRE STOPPING

4.1. General

4.1.1 Non-metallic pipe and tubing installed with cables shall be equipped with a layer of intumescent wrap strip that is a minimum of 2 inches wide. Wrap strips to be located where pipe/tubing exits holes through floors and on both sides of walls.

4.1.2 Wrap strips shall be held in place by the use of nylon tie wraps, two strands of 9 ply cord, or aluminum tape unless otherwise specified herein.

4.2. Continuous Slots Under Office Distributing Frames

4.2.1 The closing of continuous slots under office distributing frames, regardless of depth, may be accomplished in the following manner. See Figure F-9.

a) Work from below with covers in place. Use mineral wool batting of 3 or 4 inches thickness and cut 2 inches oversized to ensure a tight fit. Force mineral wool batting into the slot and press up against the covers to tightly pack all voids between vertical bundles of stub cables.

b) Insert mineral wool batting so that there are no vertical joints except at the stub cable. No bottom plates are required with this method.

c) Mineral wool batting installed over an equipment area shall be wrapped in aluminum foil to minimize dusting problems. Cutting and wrapping should be done in an area other than the telephone equipment area.

d) Smoke stop all spaces between the cable and cover plate with intumescent putty.

e) Eye protection and dust masks shall be worn by the installer for this operation.

4.3. Partially Occupied Cable Slots and Large Floor Openings

4.3.1 The occupied portion of cable slots shall be isolated from unoccupied portions and from portions fire stopped with another media by installing a steel partition between the ceiling and floor surfaces similar to the one as shown in Figure F-6A. Partitions are not required if the occupied and unoccupied portion(s) of a slot are fire stopped in the same manner with the same fire stopping products.

a) Partitions shall be made from a minimum of 16-gauge painted or galvanized sheet metal.

b) There shall be zero to 1/4 inch of clearance between the partition and the sides of the cable hole for ease of installation. The partition shall be fastened to ceiling cover plates or to the building surface at a minimum of two locations at the lower end and shall be fastened at a minimum of one location at the upper end. The use of multi-piece partitions is acceptable. Multi-piece partitions shall be fastened together with a minimum of two fasteners in a manner that assures the pieces will react as a single rigid piece when subjected to pressure.

c) A ½ inch bead of intumescent putty shall be installed around the perimeter of partitions at their interface with building surfaces, slot covers and cable hole sheathings to form an airtight seal.

d) Partitions shall also be used to segment cable holes that are fire stopped with different technologies (mineral wool, blocks, composite sheets, etc) or are fire stopped with products of different manufactures (Hilti, 3M, etc).

4.3.2 Figure F-6B shall be used as a reference when it is necessary to segment large openings into smaller openings to enable more affective cable management and/or fire stopping. In such cases partitions shall be fabricated from a minimum of 16 gauge (0.06) painted or galvanized steel and a minimum of 11 gauge steel shall be used for hole covers. The actual partitioning configuration used is dependant on floor/wall location and hole usage.

a) At this time, the 15-inch front-to-back maximum size of a cable opening shown in Figure F-6B is applicable to holes fire stopped with Hilti fire blocks. It is relative to cable pileup allowances on miscellaneous cable racks.

b) Wall cable holes greater than 2,496 square inches (17.3 sq. ft.) in size require partitioning into smaller openings when fire stopped with Hilti Fire Blocks. The longest allowable dimension comprising the 2,496 square inches is 52 inches. Reference UL Design WL-8014.

4.4. Fire Stopping Small Rectangular Floor Openings Under Office Distributing Frames

4.4.1 The closing of occupied small rectangular openings up to 4 x 10-inches in size shall be accomplished in the following manner. Refer to Figure F-10.

a) Provide a temporary method of containment on one side (top or bottom, preferably the bottom) so that material can be packed against it.

b) Pack all voids around the cables at the perimeter of the cable bundle to the full depth of the opening with mineral wool batting

c) Install a layer of intumescent putty over the mineral wool batting at the top of the hole to a minimum depth of 1 inch.

4.5. Fire Stopping Large Rectangular Openings Using 3M Products

4.5.1 The fire stopping of large rectangular cable holes using intumescent material, regardless of depth, shall be accomplished in the following manner. Refer to Table F-2.

a) Unless otherwise indicated for a particular fire stopping application, the space between the cable and intumescent cover plates shall be 1/2 inch (±1/4 inch) in width.

b) Intumescent sheets shall be installed with the galvanized steel side exposed.

c) The bottom intumescent sheet shall be supported in one of three methods listed below, in order of preference:

1. Support stirrups – Six stirrups shall be installed for support of a drop in intumescent sheet. When the cable hole is wider than 24 inches, additional stirrups shall be placed not to exceed 12 inches between stirrups. When cable growth is within ½ inch of the rear center stirrup, that stirrup shall be removed. When cable is mined beyond the mid-point of the rear of the cable hole, install a rear center stirrup. Refer to Figure F-3.

2. Modified steel ceiling cover plate – Cut the bottom steel cover plate to create a modified cover plate on the bottom of the cable hole using all existing and accessible fastener holes. A minimum of four bolts, one near each corner, is required to support modified ceiling plates at 1'-0" x 2'-0" openings. For new holes cut into existing floors, a bolt shall be placed within 2 inches of all corners. Additional bolts shall be placed around the perimeter and spaced not more than 8 inches apart. This arrangement will be used to support a drop in intumescent sheet. Refer to Figure F-4.

3. Intumescent sheet attached to the ceiling–Place a 1/4 inch bead of intumescent putty between the ceiling surface and the intumescent sheet. Bolt the intumescent sheet directly to the bottom cable hole cover support or ceiling surface. A bolt with a 1 1/4-inch fender washer shall be placed within 2 inches of all corners. Additional bolts and fender washers shall be placed around the perimeter and spaced not more than 6 inches apart. Refer to Figure F-11.

d) Where possible, install a one-piece drop in intumescent sheet. Multiple pieces shall be joined with a 2” seam strip secured with screws placed at 3” intervals. A bead of putty shall be placed_under the seam strip where the two pieces join together. Refer to Figures F-3 and F-4. For the stirrup arrangement, secure the intumescent sheet with self-tapping 1/4 x 3/4 inch sheet metal screws and 1 1/4 inch fender washers. For the modified ceiling cover arrangement, secure the intumescent sheet with self-tapping 1/4 x 3/4 inch sheet metal screws and 1 1/4 inch fender washers spaced at a maximum of 12-inch intervals.

e) A continuous dome of intumescent putty shall be placed around the cable bundle on the inside of the hole to fill the space between the cable bundle and the bottom intumescent sheet. This dome of putty shall extend a minimum of 1 inch out from the cable and 1 inch up from the bottom intumescent sheet. It shall be a minimum of ½ inch thick from the point where the cable bundle emerges from the intumescent sheet.

f) To seal the interior of the opening, a continuous ½ inch dome of approved intumescent putty shall be placed around the perimeter of the bottom intumescent sheet and the side of

the cable hole, as shown in Figure F-11. This shall include the space between the stirrups and the interior wall of the cable hole and wall and partition, if equipped.

g) To seal the top of the opening, a ¼ inch bead of intumescent putty shall be placed along the edge of the cable hole sheathing prior to installing the intumescent sheet. Refer to Figure F-11.

h) The top intumescent sheet may be comprised of multiple pieces and shall be closed as follows: A 1/4 inch minimum bead of intumescent putty shall be applied along the butted edges. The seam of the butted edges (which may extend entire width of opening) shall be covered with a 2 inches wide, 28 gauge galvanized steel strip centered over the seam. The splice strip shall be secured with ¼ inch self-tapping sheet metal screws spaced at 3 inches maximum on each side of the seam. Refer to Figure F-12.

i) For floor openings, a 1/8-inch thick steel protective cover plate shall be installed. The space between the protective cover plate and the cable shall be no closer than 1/2 inches and no farther than 4 inches. Refer to Figure F-5.

j) Steel cover plates shall be secured with a bolt placed within 2 inches of all corners Additional bolts shall be placed around the perimeter and spaced no more than 8 inches apart.

k) When the steel cover plate does not cover the total perimeter of the top intumescent composite sheet, additional bolts with fender washers shall be provided through the exposed intumescent sheet on 6 inch centers to secure the top intumescent sheet to the cable hole sheathing. Refer to Figure F-5.

l) A continuous dome of intumescent putty shall be placed around the cable bundle above the top plates. This dome of putty shall be packed tightly into the space between the cables and the composite sheet. The dome shall extend a minimum of 1 inch from the cable and up from the top of the composite sheet. It shall be a minimum of 1/2 inch thick from the point where the cable bundle emerges from the composite sheet

m) Empty cable openings shall be fire stopped using a single piece of intumescent board and steel cover plate.

4.6. Large Rectangular Wall Openings Using 3M Products

4.6.1 Wall openings for all types of fire-rated walls and partitions shall be fire stopped in the following manner. Refer to Figures F-12, F-13 and F-14.

a) Intumescent composite sheets shall be installed with the galvanized metal side exposed and shall be sized to provide a minimum 2-inch overlap around the perimeter of the opening.

b) Unless otherwise indicated for a particular fire stopping application, the space between cable and composite sheet shall be 1/2 inch (±1/4 inch) in width so that a minimum of caulk or putty material is required to seal an opening.

c) A continuous bead of approved intumescent putty shall be installed around the perimeter of the opening under the composite sheet and the wall mating surface.

d) Where necessary, the composite sheets may be pieced together in order to fit around the cables to form a continuous sheet. A 1/4-inch (minimum) bead of intumescent putty shall be applied along the seam of butted cover pieces. The seam shall be covered with a 2-

inch wide, 28 gauge galvanized steel strip centered over the seam. The seam cover shall be secured with self-tapping screws spaced at 3-inch maximum O.C. on each side of the seam. Screws located at the outside perimeter of the composite sheet shall be equipped with 1 ¼ inch fender washers under the screw head.

e) Securing screws and anchors shall be within 2 inches of all corners and not exceed 6 inches on center. Screws shall have a minimum 1-1/4 inch fender washers installed under the screw head at securing points..

f) A continuous dome of putty shall be installed_around the cable bundle as it exits the composite sheet. This dome of putty shall be 1-inch minimum out from the cable along the composite sheet and 1 inch out from the composite sheet along the cable. It shall be a minimum of 1/2 inch thick at the gap where the cable bundle emerges from the composite sheet.

4.6.2 Empty cable openings shall be fire stopped using a single piece composite sheet on both sides of the opening.

4.7. Circular Openings Using 3M Products

4.7.1 Circular openings containing cable shall be fire stopped in accordance with Figures F-16 to F-18, and F-23.

4.7.2 Mineral wool batting shall be installed at the required 1" minimum depth.

4.7.3 Intumescent caulk and/or putty shall be installed at the required 1" minimum depth.

4.7.4 Circular openings with non-metallic sleeves shall be equipped with the correct number of wrap strip layers or correct size of plastic pipe device per Table 18 of this section.

4.7.5 Apparatus surrounding penetrants shall be sealed with intumescent putty at the apparatus and building surface interface.

4.7.6 For circular opening with a Non-metallic sleeve, it shall be equipped with restricting collar per Figure F-18.

4.7.7 Openings in hollow walls shall be equipped with a properly constructed and sealed steel sleeve.

4.8 Non-metallic Pipe Using 3M Products

4.8.1 Circular openings containing non-metallic pipe shall be fire stopped in accordance with figures F-19, F-20 and F-24 at both sides of the wall.

a) Putty shall be installed at the required 1/4 or 1" minimum depth per the referenced figure.

b) Pipe shall be equipped with the correct number of wrap strip layers or size of plastic pipe device per table F 18 of this section.

c) Apparatus surrounding non-metallic penetrants shall be sealed with intumescent putty at the apparatus and building surface interface.

d) Openings in hollow walls shall be equipped with a properly constructed and sealed steel sleeve and packed with mineral wool batting.

e) The wrap strip layers shall be secured with a restrictive collar.

4.9 Metallic Pipe Using 3M Products

4.9.1 Circular openings containing metallic pipes shall be fire stopped in accordance with Figures F-21 and F-25.

a) Mineral wool batting shall be installed at a minimum of 1 inch required depth.

b) Intumescent putty or caulk shall be installed at a minimum of 1 inch required depth or the thickness of the wall; whichever is the lesser of the two. Refer to figures F-21 and F-25.

4.10 Flexible non-metallic Tubing Using 3M Products

4.10.1 Circular openings containing flexible non-metallic tubing shall be fire stopped in accordance with Figure F-22 at both sides of a wall.

a) Tubing shall be equipped with the correct number of wrap strip layers or size of plastic pipe device.

b) The area surrounding the tubing and the building surface shall be sealed with a minimum depth of 1 inch of intumescent putty.

c) Voids between adjacent runs of tubing shall be filled with a minimum depth of 1 inch of intumescent putty.

4.11 Empty Openings Using 3M Products

4.11.1 Empty circular openings shall be fire stopped in accordance with Figure F-26.

a) Mineral wool batting shall be installed at a minimum of 1 inch depth in solid floors or walls and shall fill the complete area in framed wall openings.

b) Intumescent caulk or putty shall be installed at a minimum of 1 inch of depth.

c) Openings in hollow walls shall be equipped with a properly constructed and seal steel sleeve in accordance with Figures F-23 and F-24.

4.12 Fiber Optic Cable Troughs Using 3M Products

4.12.1 Fiber optic cable troughs shall not be run through floor penetrations. Where they presently exist, the opening shall be fire stopped in the manner shown in Figures F-15.

4.13 Covered Metallic Raceways Using 3M Products

4.13.1 Covered metallic raceways that penetrate fire rated walls or floors are not recommended. However, where they are currently installed they shall be fire stopped with Hilti M&P.

4.14 Fire Stopping Using Hilti Products

4.14.1 The fire stopping of large through penetrations using Hilti FS-657 fire blocks shall be in accordance with Figures F-30 to F-33 and F-45 to F-47 as covered below and in 4.14.2. Putty pads may/should be applied to building surfaces to assist with fire block installation when necessary or desirable.

a) A single layer of minimum 1-inch wide putty pad material shall be firmly applied around the perimeter of the cable bundle and pressed into the curvatures formed by adjacent cables. Adjacent segments of layered material shall overlap a minimum of ¼ inch.

b) Layered putty material shall extend a minimum of 1 inch into cable openings. This layer of fire protection material becomes the smoke stopping element of subsequent cable layers.

c) Fire blocks shall be cut to the cable bundle's shape and to minimize the potential for air gaps. The blocks shall be installed in an overlapping (staggered) fashion to completely fill the remaining interior void of the through penetration. Blocks shall overlap a minimum of 1/4".

d) Fire blocks shall be installed flush with the floor/wall building surface and extend 5-inches into the opening for miscellaneous holes and 8-inches into the opening for power and fiber cable only holes. On a single cable rack with mixed cabling (secondary power and switchboard cabling), the blocks shall extend 5-inches into the opening. Fire block installation shall equal wall thickness for power and fiber only holes in walls less than 8-inches thick. Blocks may extend below the ceiling in the floor applications and beyond wall surfaces when covers are not required.

e) Air leaks in the fire block installation shall be sealed at the top by wedging CP-617 putty pad or CP-618 putty stick material into detected air passages. There shall be no spaces between fire blocks.

f) A ½-inch (min.) dome or minimum 1-inch wide layer of putty shall be applied around the cable bundle and other penetrating items at their interface with the fire blocks. This perimeter of putty material is required at both sides of wall openings.

g) A 1-inch wide strip of putty pad or a 1/4-inch bead of putty material shall be applied around the top perimeter of the cable hole sheathings at floor openings as indicated in Figure F-30.

h) Large floor openings shall be covered with a minimum 11 gauge steel cover that is cut to approximate the shape of the installed cable bundle. The gap between the installed cable and the steel cable hole cover shall be 1/2-inch $\pm$ 1/4-inch.

i) A 1-inch minimum dome of putty shall be applied around the entire perimeter of the cable bundle at its interface with the steel cover plate, cable rack and cable hole sheathing. This dome of putty shall overlap onto the steel cable hole surfaces a minimum of 1/2-inch.

j) Fasteners shall be located within 2-inches of cable hole corners and spaced no more than 8-inches apart.

4.14.2 Wall openings having more than 4-inches of space between the penetrants, such as cable, cable racking, raceways and conduits, and the wall opening shall be equipped with wire mesh or sheet metal retention covers on both sides of the opening. Wire mesh shall be used when the distance between the wall surface and installed fire blocks does not exceed 1/2" on either side of the opening. Sheet metal covers shall be used when the distance between the wall surface and installed fire blocks exceeds 1/2-inch on either side of the opening. For walls 8-inches or less thick, wire mesh covers may be used if the fire blocks are installed in the 8-inch direction.

a) Installed wall hole covers shall be no closer than 1 inch or more than 2-1/2 inches away from the hole penetrants.

b) Mesh covers shall be fabricated from #16 gauge galvanized 2-inch square (max.) wire mesh.

c) Sheet metal covers shall be fabricated from #20 gauge (min.) galvanized steel.

d) Covers shall be fastened to the building surface with 1/4-inch fasteners with 1-1/2" fender washers installed under the fasteners head. Cover fasteners shall be appropriate for the building surface they are installed in.

e) Fasteners shall be located within 2-inches of cable hole corners and spaced no more than 8-inches apart.

f) Cable hole covers shall extend a minimum of 3" beyond the opening of cable holes in walls.

g) Wall holes shall be closed with one type of cable hole cover. Wall holes shall not have wire mesh on one side and a steel cover plate on the other side.

Note: Hilti's strut system for supporting solid covers at wall openings may be used where space permits. Refer to figure F-49 for general strut system application guidelines.

4.15 Fire Stopping Circular Openings Using Hilti Products

4.15.1 Circular openings shall be fire stopped in accordance with Figures F-34 to F-44, and F-51.

a) Mineral wool batting shall be tightly packed into the opening at the required minimum depth.
b) Fire blocks, caulk and putty shall be installed at the required locations and minimum depth.

c) Plastic pipe and sleeves shall be equipped with the required number of wrap strip layers or proper size of collar assembly.

d) Steel sleeves installed in hollow walls shall comply with the construction elements indicated in the relevant Figure reference.

e) Fire stop plugs (figure F-51) shall not be used in void openings unless the opening is equipped with a metallic sleeve.

f) Fire stop plugs (figure F-51) shall be sealed with a 1/2" minimum dome of CP-618 putty stick. Retrofitting 3M Fire Stops.

4.16 Retrofitting 3M Fire Stops

4.16.1 Retrofitting 3M fire stops with Hilti products shall be accomplished by:

a) The vendor shall completely remove all accessible 3M materials except that used for smoke stopping the interior of cable bundles.

b) The periphery of cable bundles and building surfaces shall be thoroughly wiped to remove as much 3M material as practicable or where contact with Hilti's products is likely.

c) Modified ceiling plates used to support 3M drop-in composite sheets shall not be removed unless there is a need to do so such as a safety hazard or to avoid cable congestion.

4.17 Replacement of Hilti Fire Stop Blocks

4.17.1 Hilti FS-657 fire stop blocks shall be examined for suitability for reuse whenever cable penetrations in walls and floors are opened. The blocks shall be in one piece, compressible and pliable without tears, breaks, cracks, flaking, powdering, or signs of wear. Fire blocks showing any unacceptable conditions stated shall be removed and replaced with new block. Blocks cut to fit openings are not considered unacceptable blocks.

4.17.2 Hilti FS-657 fire stop blocks have a usable life expectancy of 25 years. After 25 years in service the old blocks shall be removed and replaced with new blocks. The examination and replacement of blocks should only occur when cable penetration is opened as a part of a cable project in the office. Blocks with fewer than 5 years of life remaining shall be replaced. Any block that is not dated shall be assumed to have been placed into service January 2005.

4.17.3 The Installation Supplier shall hand mark any new installed block with the month and year of installation with a black permanent marker pen.

a) Blocks shall be installed so the markings are clearly visible.

4.17.4 Cable penetrations may have fire blocks of different installation dates.

4.17.5 Fire blocks in penetrations of buildings that have been through a fire event shall be examined for damage, discoloration, charring, burns, intumescent expansion and replaced if any of these signs are discovered.

4.18 Fire Stopping Large Wall Openings with Hilti Board

4.18.1 Alternative method to fire stopping large through penetrations in walls using a combination of Hilti FS-657 fire blocks and Hilti CP 675T fire stop boards shall be in accordance with Figure F-31(b). The alternative method reduces the number of fire stop blocks required for fire stopping large penetrations by replacing fire stop blocks with fire stop boards.

a) Hilti FS-657 fire blocks will be applied to areas of penetration where cables and cable rack pass through wall. Procedures for fire stopping using Hilti FS-675 fire blocks shall be in accordance to paragraph 4.14. Limit fire blocks above cables to no more than three rows to avoid wire mesh requirement.

b) Hilti CP 675T fire stop boards shall be applied to areas of penetration away from cable and cable rack area.

c) The area between fire stop blocks and fire stop board shall be separated horizontally by a Hilti CP 675 T-Separator Bar fastened to the back lip of Hilti CP 675 Z-Frame. The Hilti Z-frame lengths are installed to two vertical sides and top edge of the penetration secured to studs or directly to wall if concrete or masonry. Hilti CP 619T putty,1" wide by 1/8" thick, shall be applied to inside of Z-frame between the wall and Z-frame.

d) One Hilti CP 675T fire stop board shall be cut to fit opening (within ¼") and inserted into opening until flush with back lip of Z-Frame. Hilti CP 619T putty is applied to inside perimeter of Z-frame edge prior to inserting interior board. An additional Hilti CP 675T board cut to fit opening (within ¼") is inserted flush with wall assembly over the previous interior board. Distance holders attached to interior board keeps outside board flush with wall.

e) Rotate latches across board placed on Z-frame to secure board and slide T-bar latches up to secure board. Finish by applying Hilti CP 619T putty to perimeter of board for smoke stop.

5. FIRE STOP LABEL REQUIREMENTS

5.1. Fire Stop Labels

5.1.1 The AT&T LEC approved cable hole labels (Figure F-7) shall be completed and affixed to an opening's cover plate and cable hole sheathing, building surface or cables upon completion of the fire stopping activity in a manner that will cause the label(s) to tear when the cable hole cover is removed. The label is not required when drop in ceiling plates are utilized.

a) On wall openings closed with 3M or Hilti products, the label shall be affixed to the intumescent sheet, wire mesh or solid cover plate and the building surface it is attached to.

b) For multi-piece 3M covers, a label shall be affixed across all pieces at the splice strips so that it must be removed to add or remove cables. This is in addition to the requirements in paragraph “a” above.

c) At floor openings closed with 3M or Hilti products, a label shall be applied on each side of the steel cover plate (sides paralleling cable growth).

d) For 3M composite sheets attached to ceilings, a label shall be applied on each side of the composite sheet and the building surface.

e) All existing closed and/or open cable hole labels (as shown in Figure F-7 or similar) shall be removed in their entirety before affixing new labels.

f) While a cable hole is open, the AT&T LEC approved open cable hole label, (Figure F-32), shall be completed and affixed to the cable hole opening. This label shall remain in plain view until such time the hole is permanently fire stopped.

g) For any situations where the cable hole label requirements cannot be met as noted in the above paragraphs, then the fire stop labels shall be placed across and affixed to the cables as shown in Figure F-8.

6 Building Services Fire Stopping

6.1 Scope

6.1.1 The following section provides fire stopping and smoke stopping requirements for building construction projects initiated by AT&T Corporate Real Estate. The requirements shall be conformed to when contractors perform work on any AT&T equipment building.

6.1.2 As a minimum all work performed by contractors shall be in conformance to Federal, State and local building, electrical and fire codes.

6.1.3 Fire stop and smoke stop requirements shall be applied to any penetrations of fire rated walls or floors using approved methods to maintain the fire resistance rating. At minimum the fire stop systems used shall be 2-hour rated.

6.2 Wall Penetrations

6.2.1 Upon completion of cutting rectangular wall penetration and preparing penetration for use by Network, the opening shall be fire and smoke stopped in accordance to requirements stated in this document.

6.2.2 Wall penetrations shall be finished properly with no rough edges exposed, no sharp edges, hollow spaces, surfaces protected from release of loose concrete, sand, cement or gypsum powder. Edges of walls shall be trimmed and prepared for possible attachment of steel plate, wire mesh or other penetration closing material with threaded fastener to outside surface of opening.

6.2.3 Rectangular wall penetrations cut in concrete with series of circular borings that may leave scalloped edges shall be finished with steel finishing trim. The trim shall completely cover cut areas around and through the opening plus scalloped surfaces shall be filled with smoke stopping putty so smoke does not move through that space.

6.2.4 Wall penetrations not used immediately for cable racks, pipes, conduits shall be closed with Hilti Fire Stop methods using Hilti CP675T Fire Stop Board and Hilti CP675T Z-Frame system as shown in Figure F-52 or Hilti fire blocks as shown in Figure F-31.

6.2.5 Penetrations that have cable racks and cables running though them shall be fire stopped in accordance to methods referenced in paragraphs 2, 3 and 4 for Network equipment applications of this document.

6.3 Floor Penetrations

6.3.1 Upon completion of cutting rectangular floor penetration and preparing penetration for use by Network, the opening shall be fire and smoke stopped in accordance to requirements stated in this document.

6.3.2 Floor penetrations shall be finished properly with no rough edges exposed, no sharp edges, surfaces protected from release of loose concrete, sand, or cement. Edges of floor shall be trimmed and prepared for installing sheathing if floor penetration is intended for network cable.

6.3.3 Cable hole sheathing assembly shall be steel C-channel surround of top perimeter. Floor penetrations for other applications shall have inside edges finished with steel angles.

6.3.4 Waterproofing shall be installed at the floor under new cable hole sheathings and equipment frameworks with cable access from the bottom such as BDFBs in accordance with Figure F-1 using a bead of intumescent caulk or non-hardening gasket compound such as Permatex No.2.

6.3.5 The Installation Supplier shall use four fasteners when installing cable hole sheathings up to 35 inches in any direction (one at each corner). Six fasteners shall be used when installing cable hole sheathings 36 inches or larger in any direction. The holes on the ends of the channel (1'-0" direction) are there in case the holes in the long direction cannot be used.

6.3.6 Rectangular floor penetrations cut in concrete with series of circular borings that may leave scalloped edges shall be finished with steel finishing trim. The trim shall completely cover cut areas around and through the opening plus scalloped surface shall be filled with smoke stopping putty so smoke does not move through that space.

6.3.7 Penetrations not used immediately for cable racks, pipes, conduits shall be closed with Hilti Fire Stop methods using Hilti FS-657 Fire Stop Blocks and a steel plate cover over opening as shown in Figure F-53.

6.3.8 Penetrations that have cable racks and cables running through them shall be fire stopped in accordance to methods referenced in paragraphs 2, 3 and 4 for Network equipment applications of this document.

6.4 Water, Compressed Air, Fuel, Natural Gas, Drain Pipes

6.4.1 Steel, plastic or plastic encased pipes running through walls or floors in equipment buildings shall be fire stopped and smoke stopped to requirements of this document.

6.4.2 Penetrations for pipes may be circular bores or rectangular cut penetrations in concrete, block or wallboard. Each type of penetration requires the appropriate method designated to properly fire and smoke stop that opening.

6.4.3 Wall or floor cuts made with circular bore for installation of steel pipes shall be fire stopped following pipe installation with methods shown for Hilti Sleeve or Collars in Figures F-54 and F-55.

6.4.4 Wall or floor cuts of rectangular openings for multiple runs of pipes shall be fire and smoke stopped with Hilti FS-657 Fire Stop Blocks and Hilti CP-619T Smoke Stop Putty as shown in Figure F-56. Wall openings having more than 4-inches of space between the penetrants, such as cable, cable racking, raceways and conduits, and the wall opening shall be equipped with wire mesh or sheet metal retention covers on both sides of the opening. Wire mesh shall be used when the distance between the wall surface and installed fire blocks does not exceed 1/2"

on either side of the opening. Sheet metal covers shall be used when the distance between the wall surface and installed fire blocks exceeds 1/2-inch on either side of the opening.

6.5 HVAC Duct

6.5.1 HVAC rectangular ducts running through walls shall be fire stopped and smoke stopped to the requirements of this document.

6.5.2 Penetrations cut into wall for HVAC rectangular ducts shall be sized as close to duct dimensions as possible. Minimal gap between duct and wall opening shall be maintained so excessive filling material will not be necessary. However, clearance between ½ to 1 inch should be provided between wall and HVAC duct to permit expansion and contraction of sheet metal and lateral movement of HVAC duct in wall penetration.

6.5.3 HVAC duct shall be supported by hanger rods from ceiling. HVAC duct shall be supported by ceiling hangers on both sides of the wall opening and duct should not contact wall as it enters or leaves opening.

6.5.4 Flashing made of minimum 14 gauge sheet metal around the perimeter of the HVAC duct with 1" bead of Hilti CP-619T Smoke Stopping Putty around flashing and HVAC duct wall shall be required for fire stopping and smoke stopping these penetrations as shown in Figure F-57.

6.5.5 Larger cutouts in wall resulting in an oversize opening for the HVAC duct requires filling all gaps on top, side and bottom with tightly packed mineral wool and 14 gauge sheet metal cover on both sides of wall Sheet metal cover shall be smoke stopped with ¼" bead of Hilti CP-619T Smoke Stopping Putty under cover and a 1" dome around cover and duct wall joint as shown in Figure F-57B.

6.6 Electrical Conduit

6.6.1 Electrical conduit used for AC power wiring running through walls and floors shall be fire stopped and smoke stopped to requirements of this document.

6.6.2 Circular electrical conduit running through walls or floors in circular bored hole shall be fire and smoke stopped as shown in Figures F-54 or F-55.

6.7 Junction Boxes and Other Wall Mounted Equipment

6.7.1 Electrical junction boxes requiring cutouts in walls shall require smoke stopping at the box cover plate to prevent intrusion of smoke. A strip of Hilti CP-619T Smoke Stop Putty shall be applied to perimeter on the back of the cover plate prior to attaching plate to the junction box. Putty shall be formed flat to permit cover to seat flush with outlet or switch.

6.7.2 Wall mounted equipment requiring a cutout in a wall shall be smoke stopped to prevent intrusion of smoke. A strip of smoke stop putty shall be applied to the inside surface of the mounting plate around the perimeter to seal the equipment to the wall. If the mounting plate does not overlap the wall opening, the smoke stop putty shall be applied around the perimeter of the equipment on the surface sealing any openings between the wall and equipment.

6.7.3 Any installation of junction boxes or wall mounted equipment requiring cutouts to both sides of wall resulting in a through hole to the fire rated wall, shall be fire stopped to return the wall to original fire rating.

6.8 Doors and Fire Dampers

6.8.1 Doors installed in fire rated walls shall be a fire resistive door of F-rating not less than the rating of the wall. Doors shall have that rating stated on a label affixed to the door.

6.8.2 Doors shall have seals to limit smoke intrusion around all surfaces of door jambs and an under door sweep.

6.8.3 Automatic door closing feature shall be provided with door to keep door closed at all times.

6.8.4 Fire dampers shall be fitted with seals to prevent intrusion of smoke with vanes in their closed position. Damper shall close with automatic actuator provided with assembly.

6.8.5 Fire dampers shall be sealed around the damper frame's perimeter with Hilti CP-619T Smoke Stop Putty.

6.9 Top of Wall Joints

6.9.1 Fire resistive walls shall be constructed from floor to building ceiling unless lay-in ceiling panels are provided to a fire resistive ceiling of F rating not less than the required rating of the wall.

6.9.2 Top of wall joints between wall and ceiling shall be fire stopped and smoke stopped in compliance to building and fire code requirements.

6.9.3 Walls shall be designed and installed to seismic design conditions applicable to site conditions and building usage.

REQUEST FOR TECHNICAL ASSISTANCE RESPONSE

FIRE STOPPING NON-STANDARD THROUGH-PENETRATION ASSEMBLY
TELECOMMUNICATIONS FACILITIES

Author's RFTA Ref. No.

Date _____ Telco Job Ref. No. _____ Office CLLI _____ Floor _____

Office Address _____ Cable Hole Desig. _____

AT&T LEC Eqpt. Engr. _____ Phone _____

Submitted By: _____ Company**:** _____

Phone: _____ FAX: _____ Response Needed By: _____

Building Surface Construction: Floor ___ Wall ___ Thickness _____ F Rating (if known) ___ hr.

Framed/Hollow Wall _____ Concrete/Block Wall _____

Size Of Opening _____ Describe Hole Lining/Sheathing If Any: _____

Use Of Space On Both Sides Of Opening: Side A: _____ Side B: _____

Penetrating Apparatus (include cable bundle size if applicable): _____

Function Of Fire Stop: Permanent Closing _____ Re-enterable Closing _____

The problem/situation (By Installation Contractor):

Proposed resolution (By Hilti/AT&T Approval Team):

Send Request To:

Hilti Fire Protection Engineering Team
Ph: 1-800-886-8915 FAX 918-254-1679 E-mail Chad.Stroike@hilti.com

Approved ___ Denied ___

Questions to AT&T: Larry Wong, Ph. 925 823-4544 E-mail LW6932@att.com

Comments:

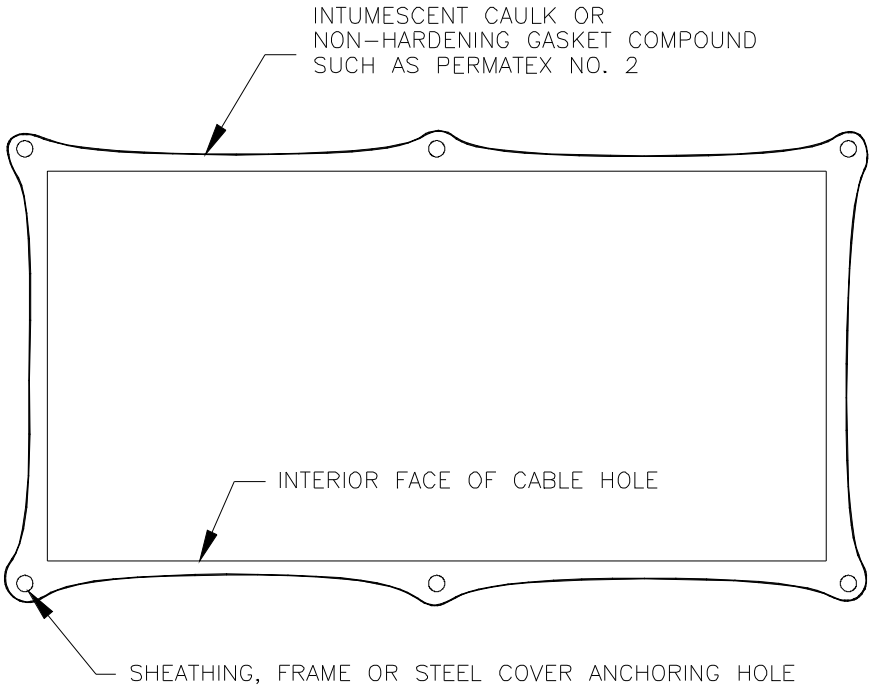
TABLE F-1 – SUMMARY OF CHANGES IN SECTION F

Change	Item in 11/1/05 Issue	Item in this Issue
Revised		
Deleted		
Added		

TABLE F-2 – INDEX OF FIGURES

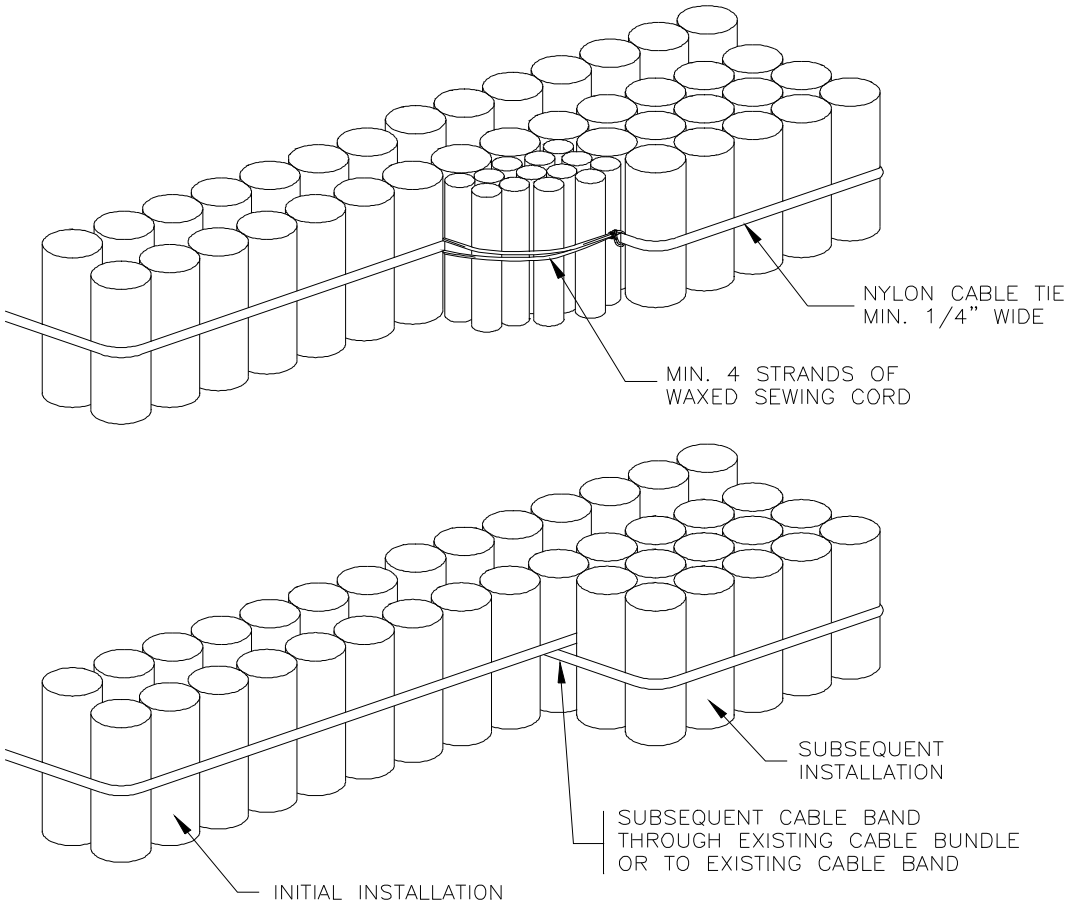
Ln	Figure	Subject				
1	F-1	Waterproofing large holes in floors				
	F-2	Banding cable				
	F-3	Stirrups for intumescent composite sheet support				
	F-4	Modified ceiling plates for intumescent composite sheet support				
5	F-5	Protective covers for intumescent composite sheets at floors				
	F-6	Cable slot partitioning arrangements				
	F-7	Cable hole label descriptions				
	F-8	Cable hole label installation at wall openings without solid covers				
10	Pre-divestiture Mineral Wool Fire Stopping For Office Distributing Frames					
	F-9	Continuous slots under distributing frames				
	F-10	Small rectangular slots under distributing frames				
	F-47	Hilti fire block orientation guide				
	F-48	Cover junctioning – Large holes using Hilti fire blocks				
	F-49	Hilti solid cover strut kit guide				
	F-50	Fire stop application adjacent wall constructions				
	Cross Reference of Approved Supplier Fire Stop Systems					
15	**Hole Type**	**Construction**	**Size**	**Penetrant**	**3M**	**Hilti**
	Large Rectangular	Floor		Cable/Void	F-11	F-30, 45, 46
		Wall	-	Cable/Void	F-12	F-31
	Sm. Rect.	Floor/Wall	≤84 sq. in.	Non-Met. Pipe	F-13	F-32
	Large Rectangular	Floor/Wall	-	ENT	F-14	F-32
20		Wall	-	ADC FiberGuide	F-15	F-33
	Circular	Solid Floor/Wall	≤6" Dia.	Cable	F-16	F-34
			≤4" Dia.	Cable/Non-Met. Slv.	F-17	F-35
			≤4" Dia.	Cable/Non-Met. Slv.	F-18	F-36
			≤7" Dia.	Non-Met. Pipe	F-19	F-37
			≤4" Dia.	Cable/Metallic Slv.		F-51
25			≤6" Dia.	Non-Met. Pipe	F-20	F-38
			≤6" Dia.	Metallic. Pipe	F-21	F-39
			≤4" Dia.	Single ENT	F-22	F-40
			≤5" Dia.	Multiple ENT	F-22	-
			≤4" Dia.	Void	F-26	F-44
30		Hollow Wall	≤5" Dia.	Non. Met. Pipe	F-19	-
			≤4" Dia.	Cable	F-23	F-41
			≤4" Dia.	Non. Met. Pipe	-	F-42
			≤7" Dia.	Non. Met. Pipe	F-24	-
			≤3" Dia.	Metallic Pipe	F-25	F-43
35			≤6" Dia.	Cable/Void	F-26	F-44

FIGURE F-1 – TYPICAL WATERPROOFING OF LARGE HOLES IN FLOORS



(REVISED – ADDED INTUMESCENT CAULK TO SEALER DESCRIPTION)

FIGURE F-2 – APPLICATION OF CABLE BANDING FOR SMOKE STOPPING



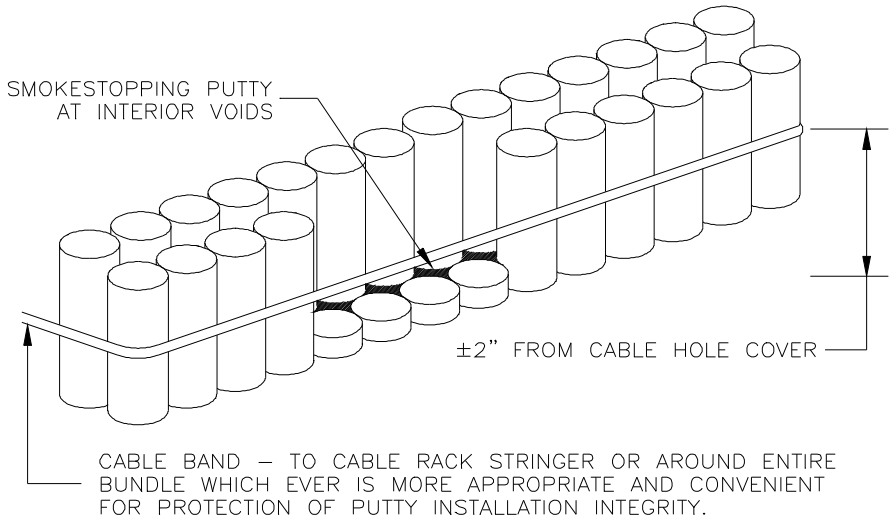
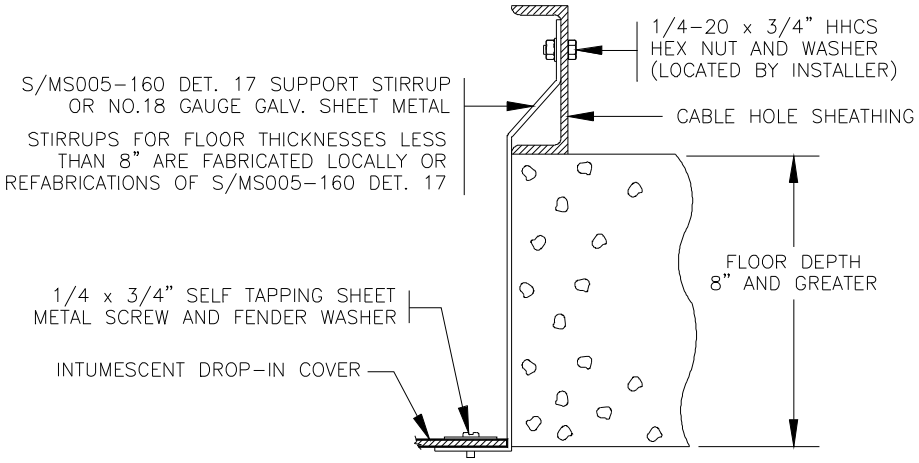


FIGURE F-3 – CABLE HOLE SET-UP FOR COMPOSITE SHEET PRODUCTS USING SUPPORT STIRRUPS (UL FB-3004 METHOD)



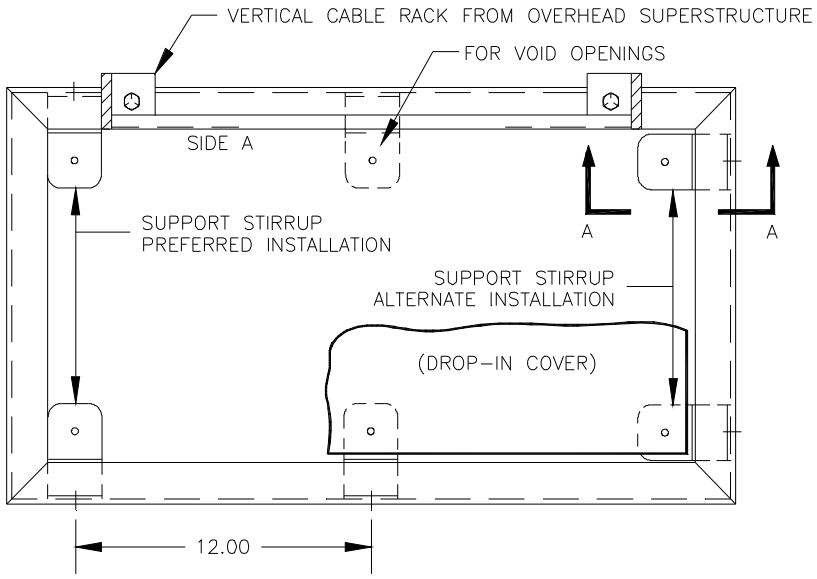
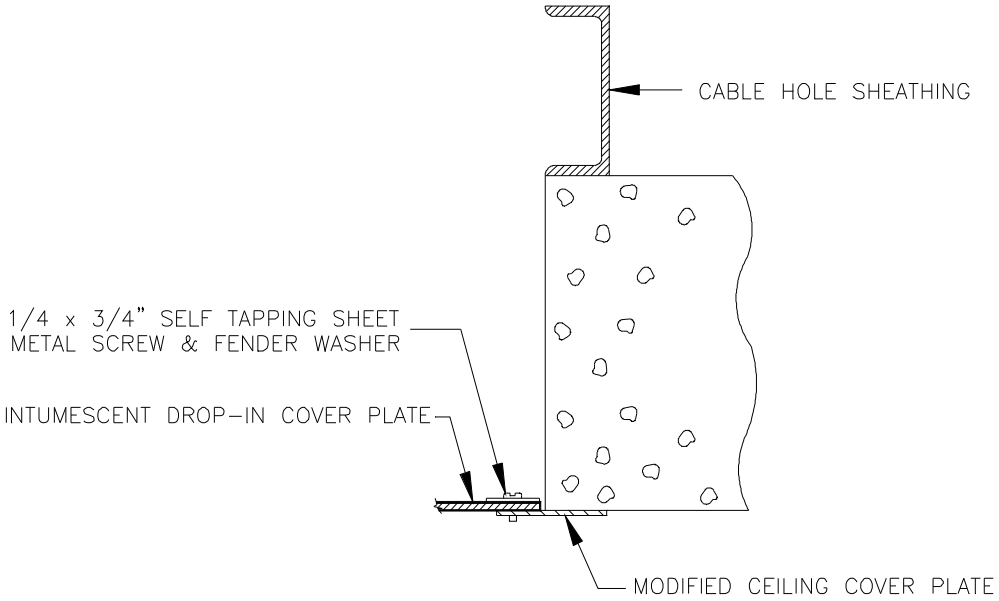


FIGURE F-4 – CABLE HOLE SET-UP FOR COMPOSITE SHEET PRODUCTS USING MODIFIED CEILING PLATE SUPPORT (UL FB-3004 EJ)



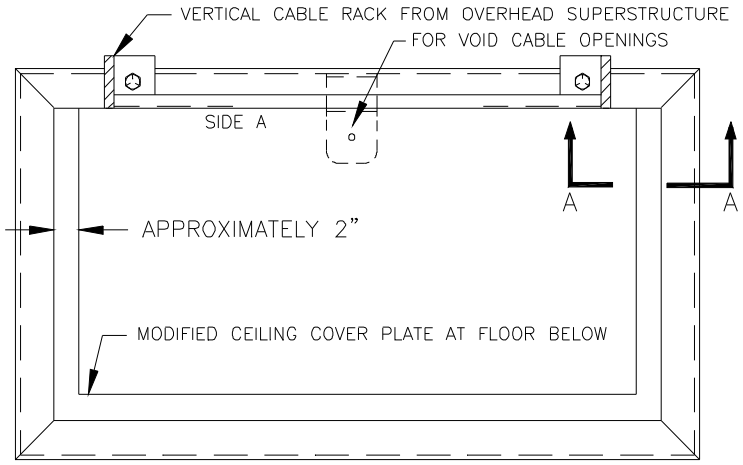


FIGURE F-5 – METHOD OF PROTECTING EXPOSED INTUMESCENT COVERS AT FLOOR OPENINGS

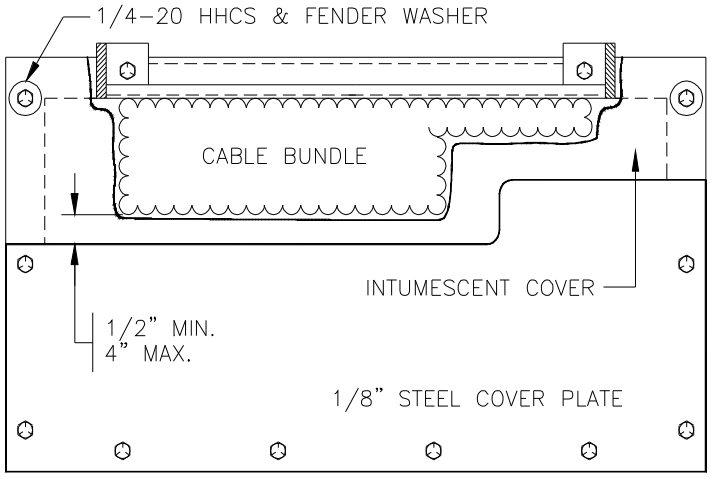


FIGURE F-6A – PARTITIONING CABLE SLOT IN FLOOR

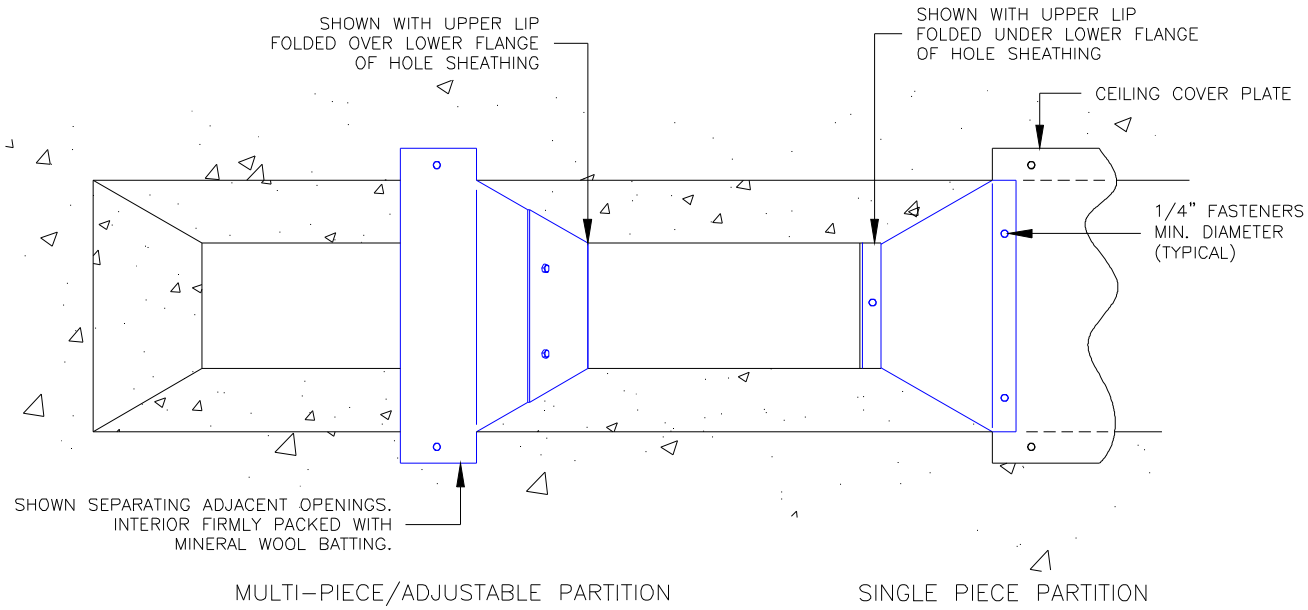
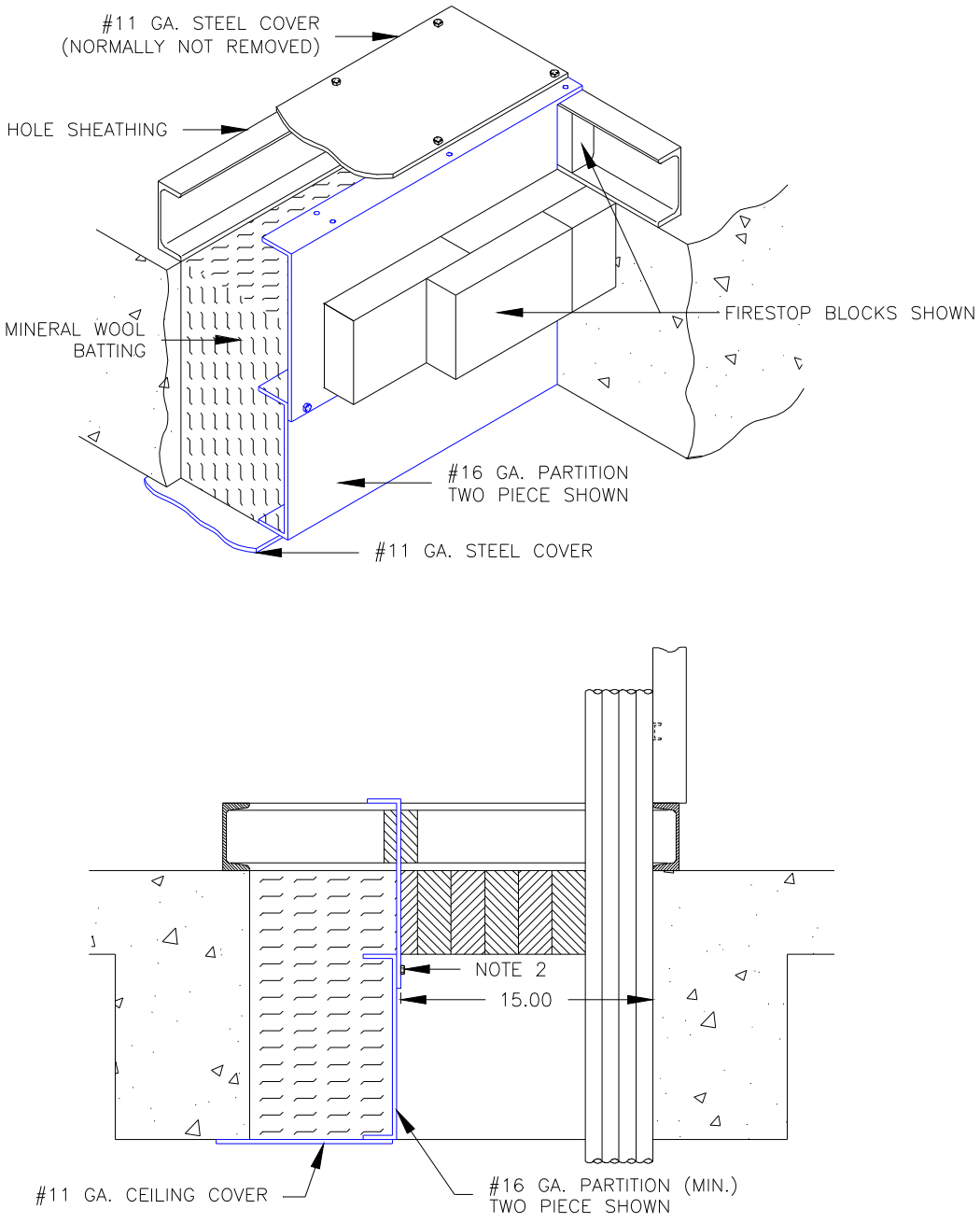


FIGURE F-6B – SEGMENTING LARGE FLOOR OPENINGS INTO SMALLER ONES



NOTE 1. SINGLE PIECE PARTITIONS MAY BE USED WITH FLOORS UP TO 12–INCHES DEEP. MIN. 1/4–INCH FASTENERS USED THROUGHOUT ASSEMBLY.

NOTE 2. FASTENERS OF TWO PIECE PARTITIONS TO BE LOCATED BELOW FIRESTOP MEDIUM, AT EACH END OF PARTITION AND ON APPROX. 8 CENTERS.

FIGURE F-7 – TYPICAL FIRE STOP LABELS

AT&T LEC

THIS CABLE HOLE OPENED BY:

SUPPLIER NAME: _____

LEC TEO #: _____ DATE/TIME OPENED: _____

SUPPLIER CONTACT NUMBER: _____

Open Cable Hole Label
(Black Characters On Green Background)
(A)

AT&T LEC

THIS CABLE HOLE HAS BEEN PROPERLY FIRE STOPPED IN ACCORDANCE WITH ATT-TP-76300

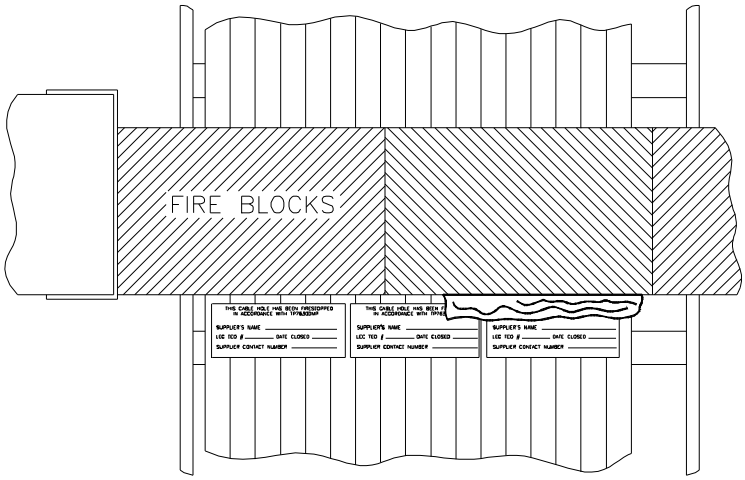
SUPPLIER'S NAME: _____

LEC TEO #: _____ DATE CLOSED: _____

SUPPLIER CONTACT NUMBER: _____

Closed Cable Hole Label
(Black Characters On Orange Background)
(B)

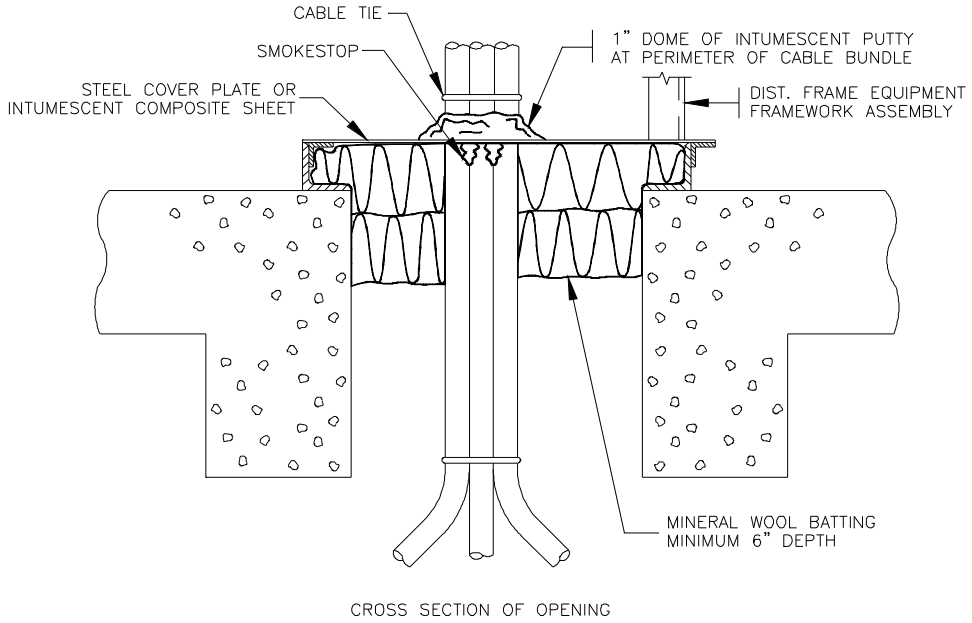
FIGURE F-8– APPLICATION OF FIRE STOP LABELS



LABELS APPLIED ACROSS CABLE BUNDLE PRIOR TO SEALING BLOCK INSTALLATION. CONTRACTOR AND JOB INFORMATION NOT COVERED BY PUTTY.

(REVISED TO ADD TEXT)

FIGURE F-9 – FIRE STOPPING CONTINUOUS SLOTS UNDER OFFICE DISTRIBUTING FRAMES



CROSS SECTION OF OPENING

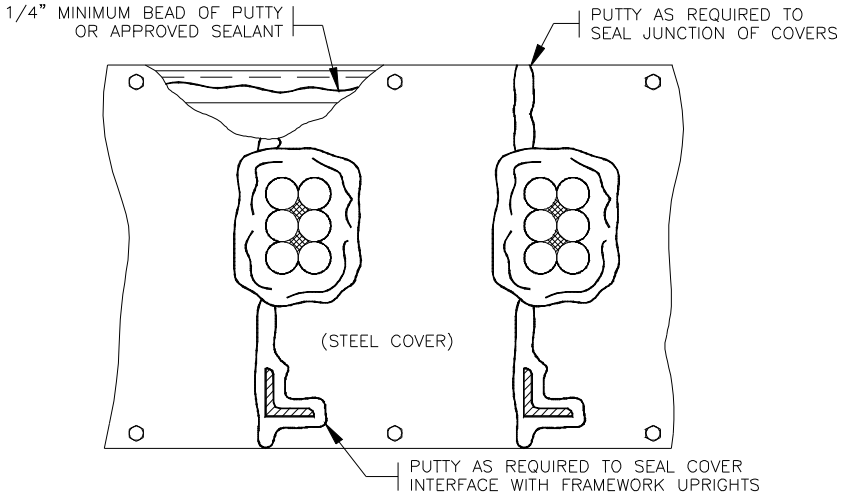


FIGURE F-10 – FIRE STOPPING SMALL RECTANGULAR OPENINGS UNDER OFFICE DISTRIBUTING FRAMES

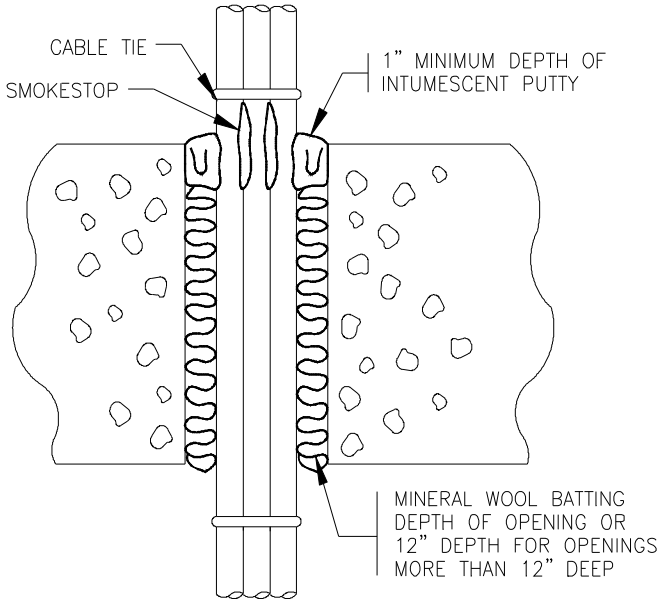
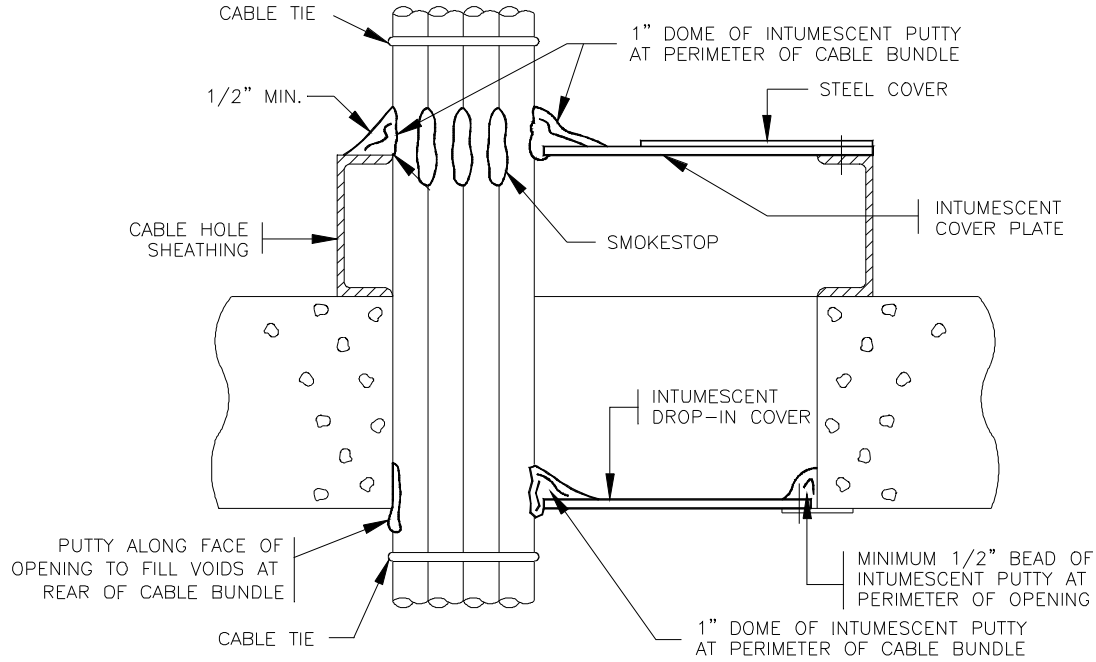
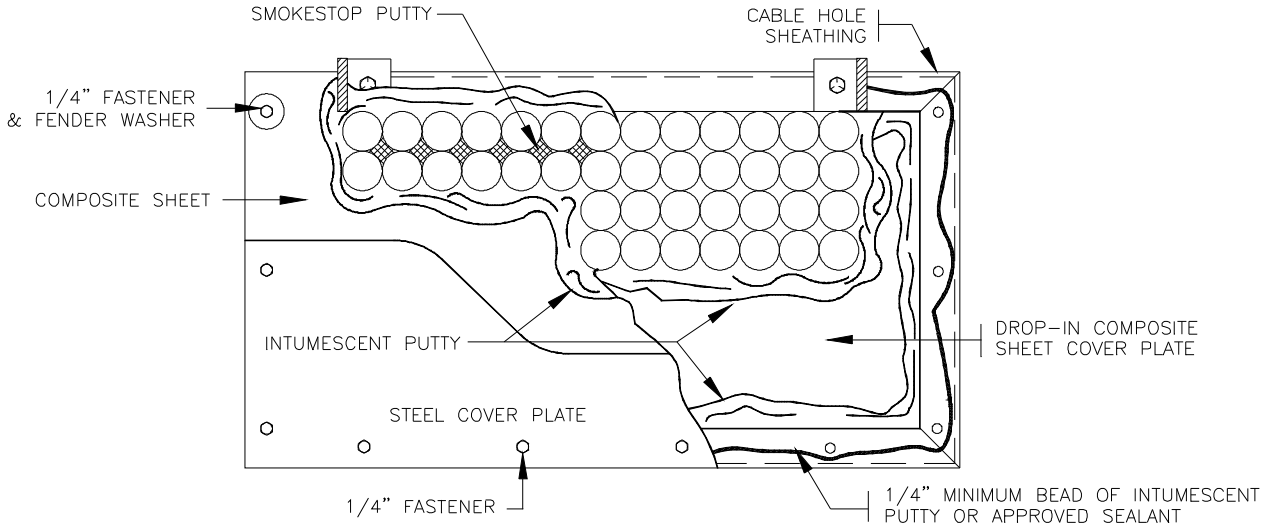


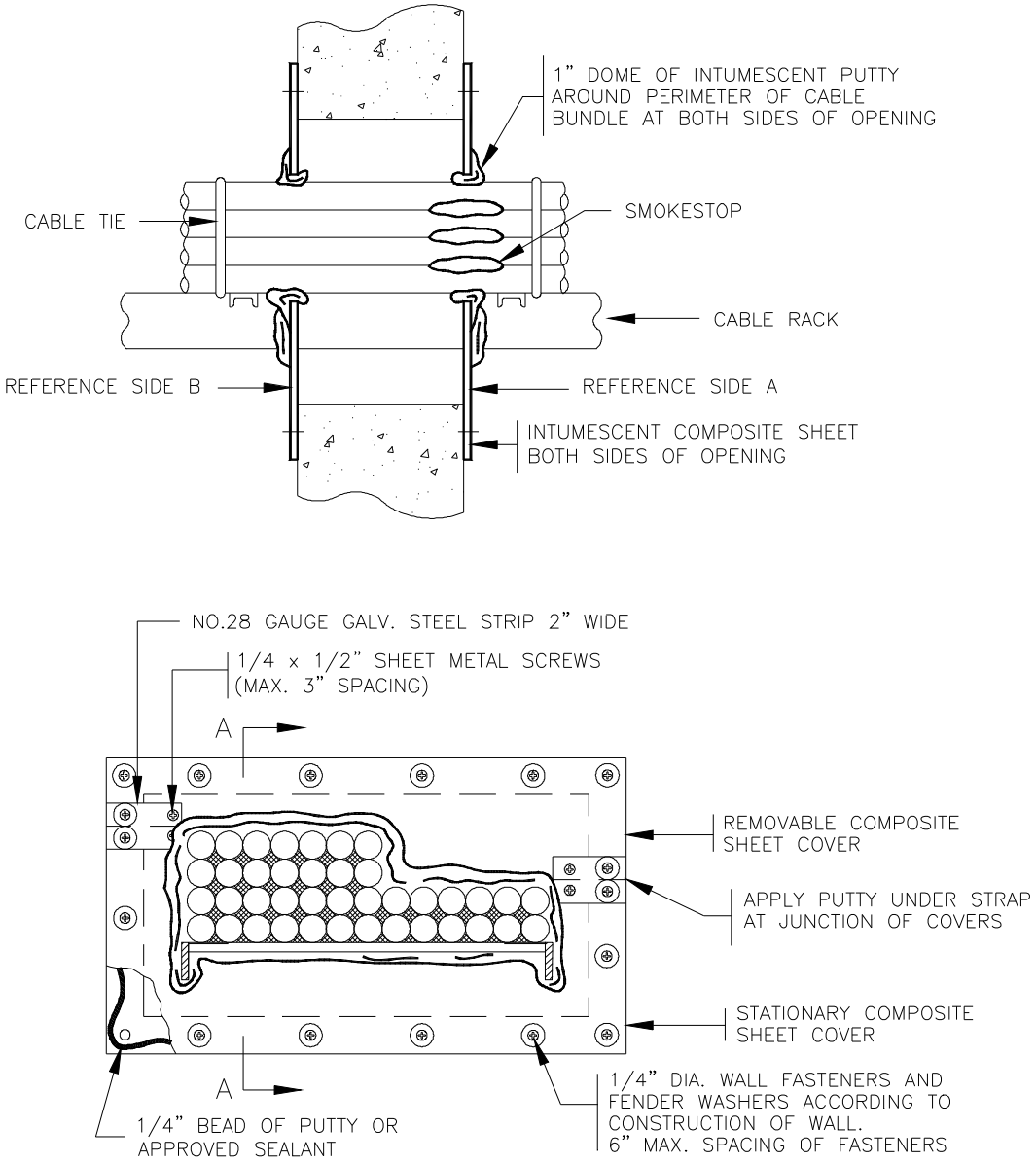
FIGURE F-11 – FIRE STOPPING LARGE FLOOR OPENINGS USING INTUMESCENT COMPOSITE SHEET PRODUCTS (UL FB-3004)





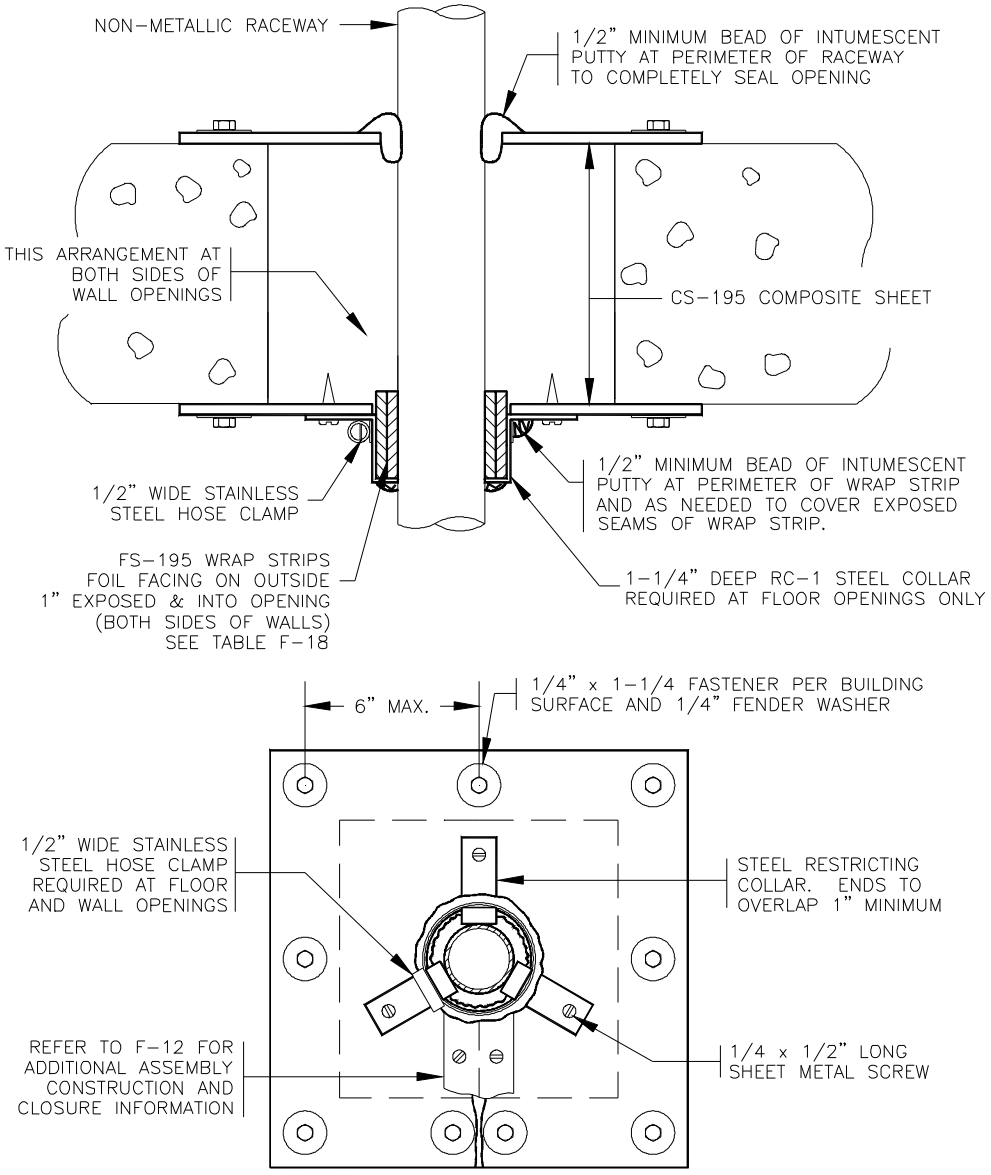
(UPDATED TO ADD STEEL COVER)

FIGURE F-12 – FIRE STOPPING LARGE WALL OPENINGS USING INTUMESCENT COMPOSITE SHEET PRODUCTS (UL CAJ-4003)



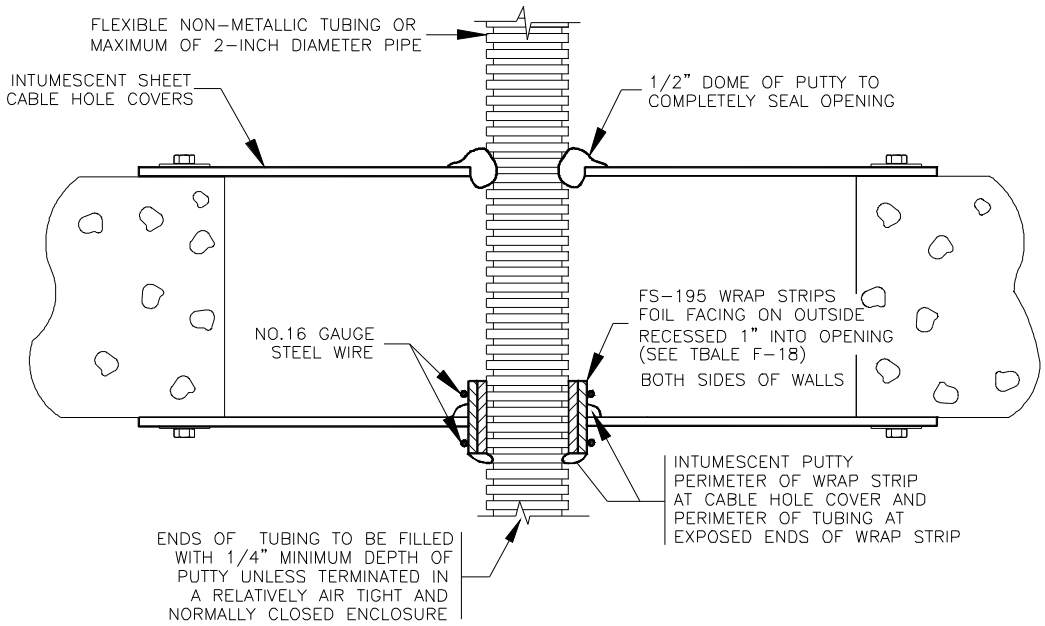
(REVISED – CHANGED 1/4" PUTTY BEAD LOCATION)

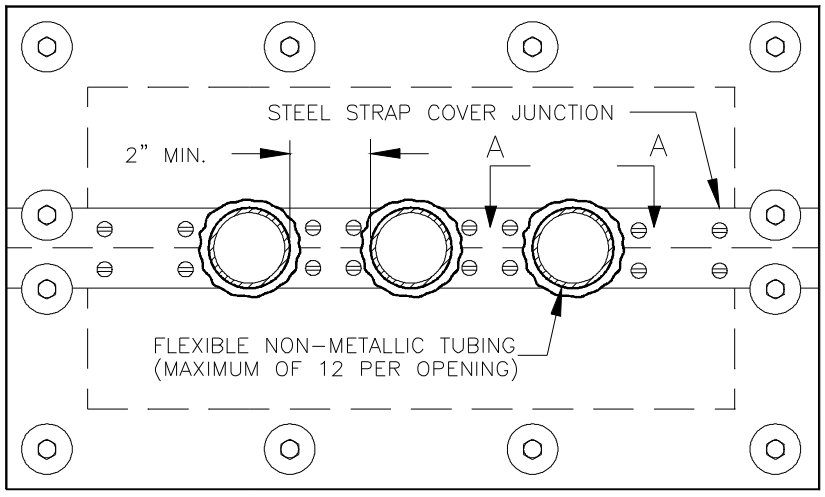
FIGURE F-13 – FIRE STOPPING NON-METALLIC PIPE IN LARGE RECTANGULAR OR CIRCULAR OPENINGS USING INTUMESCENT COMPOSITE SHEETS (OPENINGS UP TO 84 IN.^{2}) (ULCAJ-2003)



(REVISED – CHANGED TO TABLE F-18 (TOP) AND FIGURE F-12 (BOTTOM) REFERENCE ADDED "BOTH SIDES OF WALLS" (TOP), RECESSED DEPTH and FOIL FACING LOCATION)

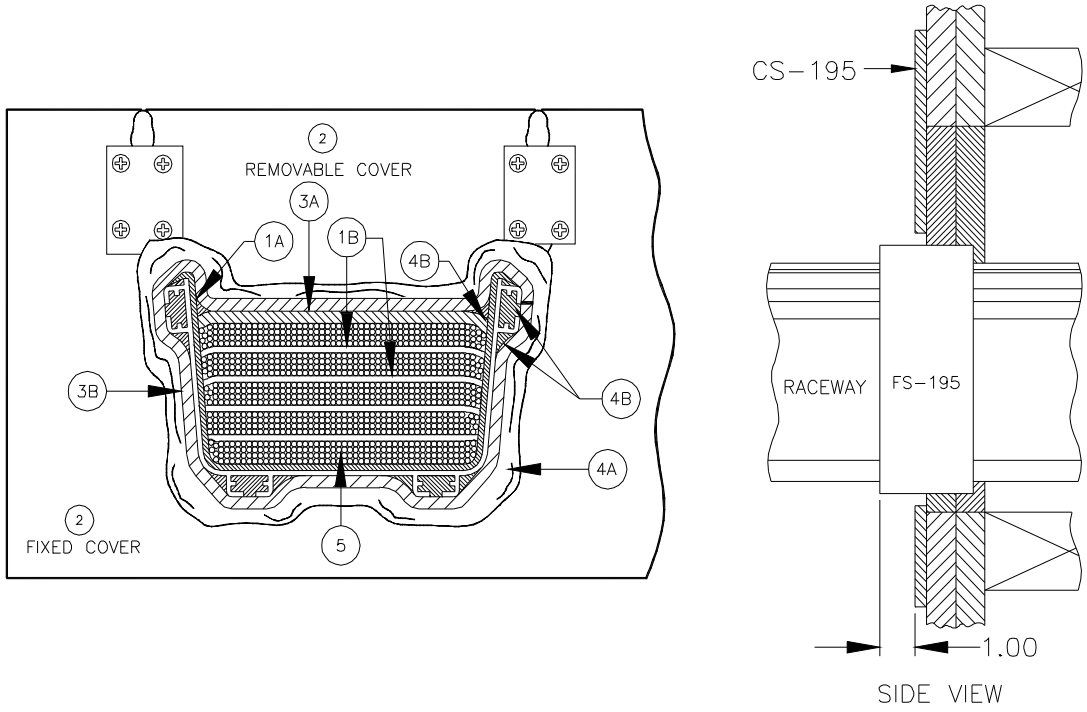
FIGURE F-14 – FIRE STOPPING FLEXIBLE NON-METALLIC TUBING IN LARGE RECTANGULAR OPENINGS USING INTUMESCENT COMPOSITES SHEETS (UL CAJ-2030)





(REVISED – REF TO TABLE F-18 & "BOTH SIDES OF WALLS", FOIL FACING DIRECTION AND RECESSED DEPTH)

FIGURE F-15 – FIRE STOPPING ADC RACEWAY IN LARGE WALL OPENINGS USING INTUMESCENT COMPOSITE SHEETS (UL WL-6002)



1. MPP+ Moldable Putty Pad

   1A. Interior of raceway lined with single 4" wide strip of MMP+ putty pad. A 4" wide strip to overlap top of raceway sides 1/2" and extend a minimum 1" from the wall surface.

   1B. A single strip of 2" wide MPP+ putty pad formed across top of 1/2" maximum cable pileup. Putty strip to extend a minimum 1" from wall surface.

2. CS-195+ Composite Sheet

Installed per standard fastening and opening overlap requirements. Fixed and removable portion of cable hole cover cut to fit contour of raceway and installed cable. Space between covers and raceway to be $\pm$1/2" to allow insertion of FS-195+ Warp/Strip around perimeter of raceway.

3. FS-195+ Wrap/Strip

   3A. Apply a single layer of FS-195+ Wrap Strip across the top of cable bundle. This layer of wrap strip to be relocated to top of cable bundle as additional cable is installed.

   3B. Raceway and installed cable enclosed by a single layer of FS-195+ Wrap Strip. Wrap strip to overlap top of either side of raceway and extend a minimum of 1" from wall surface.

4. MPS-2+ Putty Stix

   4A. A min. 1/4" bead of bulk putty to be installed around perimeter of FS-195+ Wrap/Strip to seal opening. Putty to be wedged into space between composite sheet and wrap strip so that wrap strip is held against raceway and installed cable. Putty to overlap composite sheet a minimum 1/4".

   4B. Additional putty to be applied around the exposed side of wrap strip to seal all gaps and spaces between wrap strip and raceway and to plug interior of raceway support channels.

5. 3MM Diameter Fiber Optic Cables

Maximum of 960 jumper cables per raceway (approximately 3/4 visual fill). Cables to be installed and layered with single layer of 2" wide MPP+ pad for every 1/2" of cable pileup until pileup nears 3/4 visual fill. Install 1 layer of FS-195+ Wrap/Strip at the top of cable pileup.

FIGURE F-16 – FIRE STOPPING CABLE IN CIRCULAR OPENING UP TO 6" DIAMETER IN CONCRETE/MASONRY FLOORS AND WALLS (UL CAJ-3021)

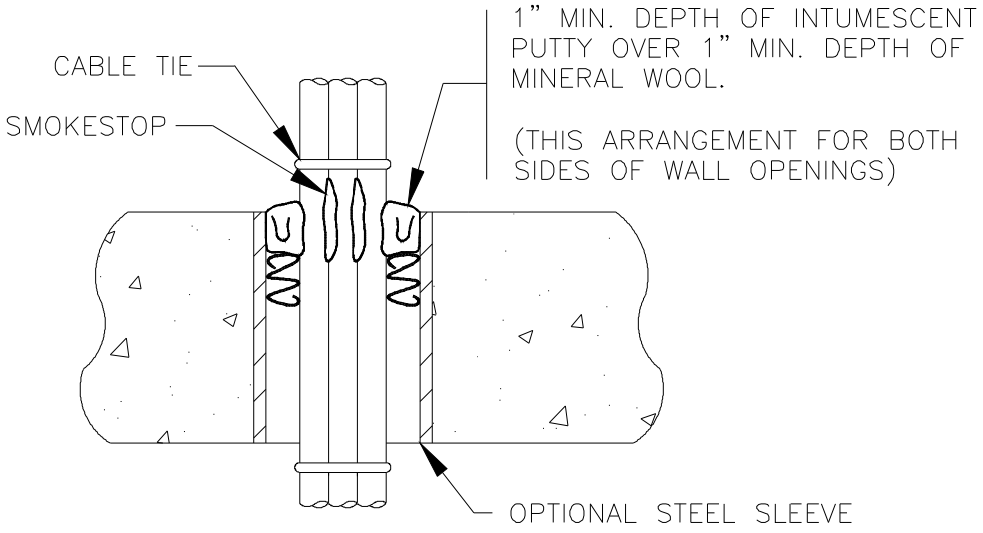


FIGURE F-17 – FIRE STOPPING CABLE IN CIRCULAR OPENING UP TO 4" DIAMETER IN CONCRETE/MASONRY FLOORS AND WALLS HAVING A NON-METALLIC SLEEVE – SLEEVE EXTENDS 2" OR LESS BEYOND BUILDING SURFACE (UL CAJ-3058 EJ)

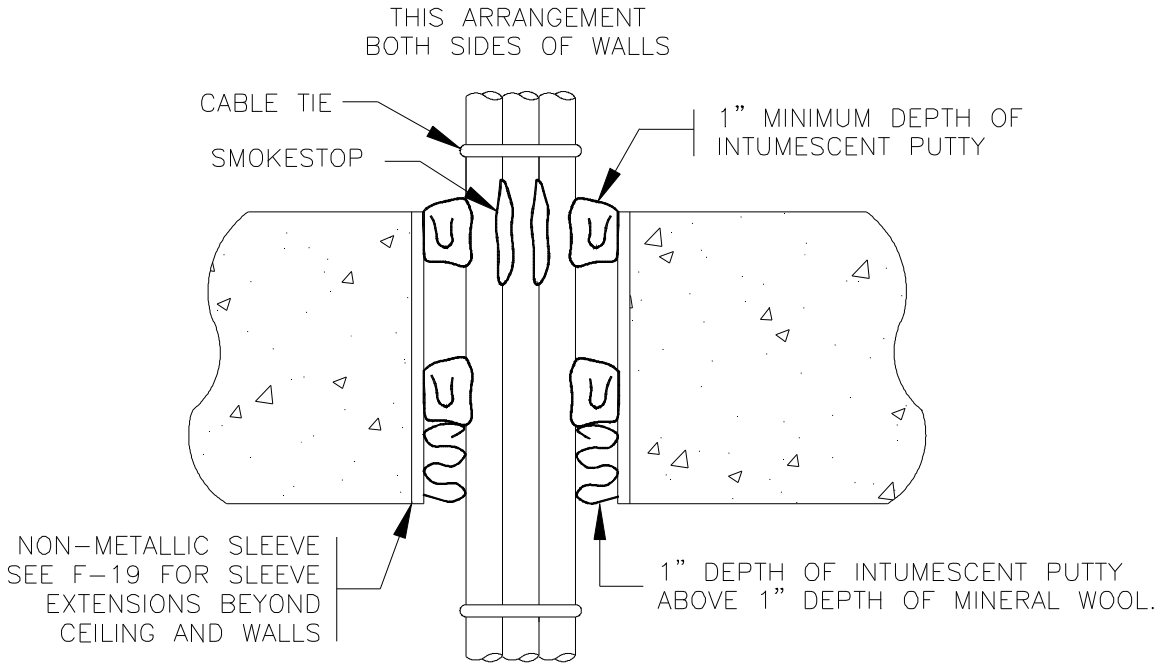


FIGURE F-18 - FIRE STOPPING CABLE IN CIRCULAR OPENING UP TO 4" DIAMETER IN CONCRETE/MASONRY FLOORS AND WALLS HAVING A NON-METALLIC SLEEVE – SLEEVE EXTENDS MORE THAN 2" BEYOND BUILDING SURFACE (UL CAJ-3058 EJ)

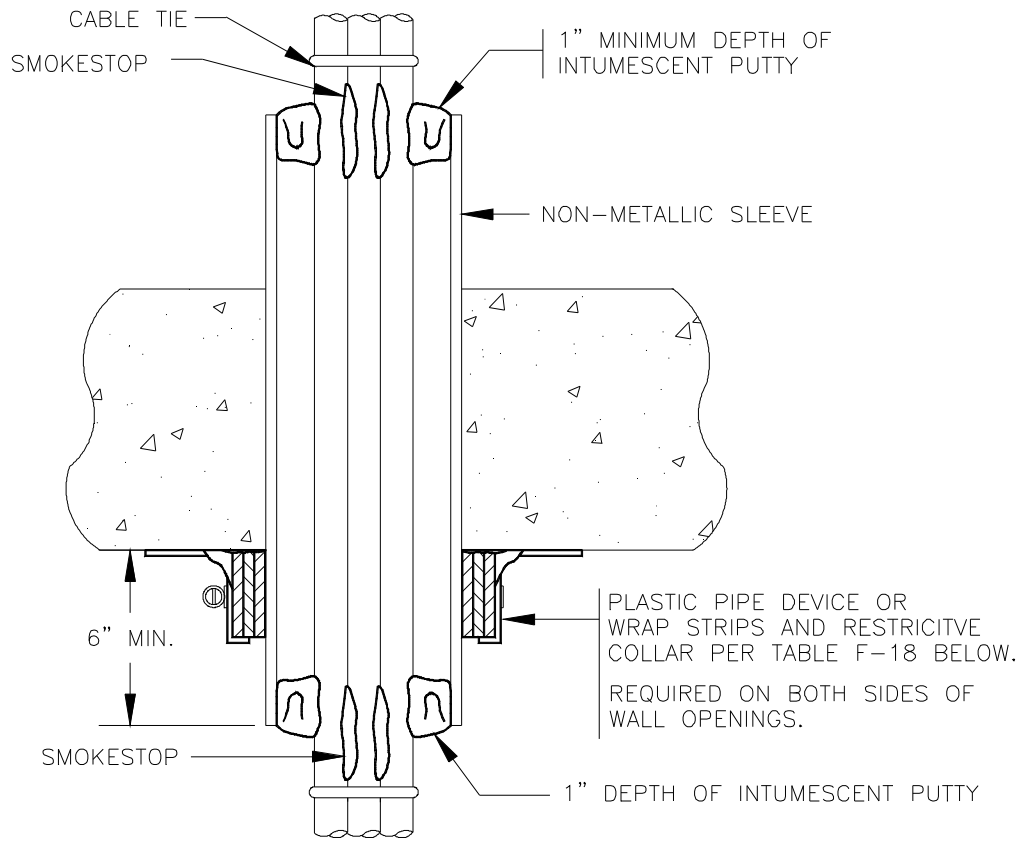
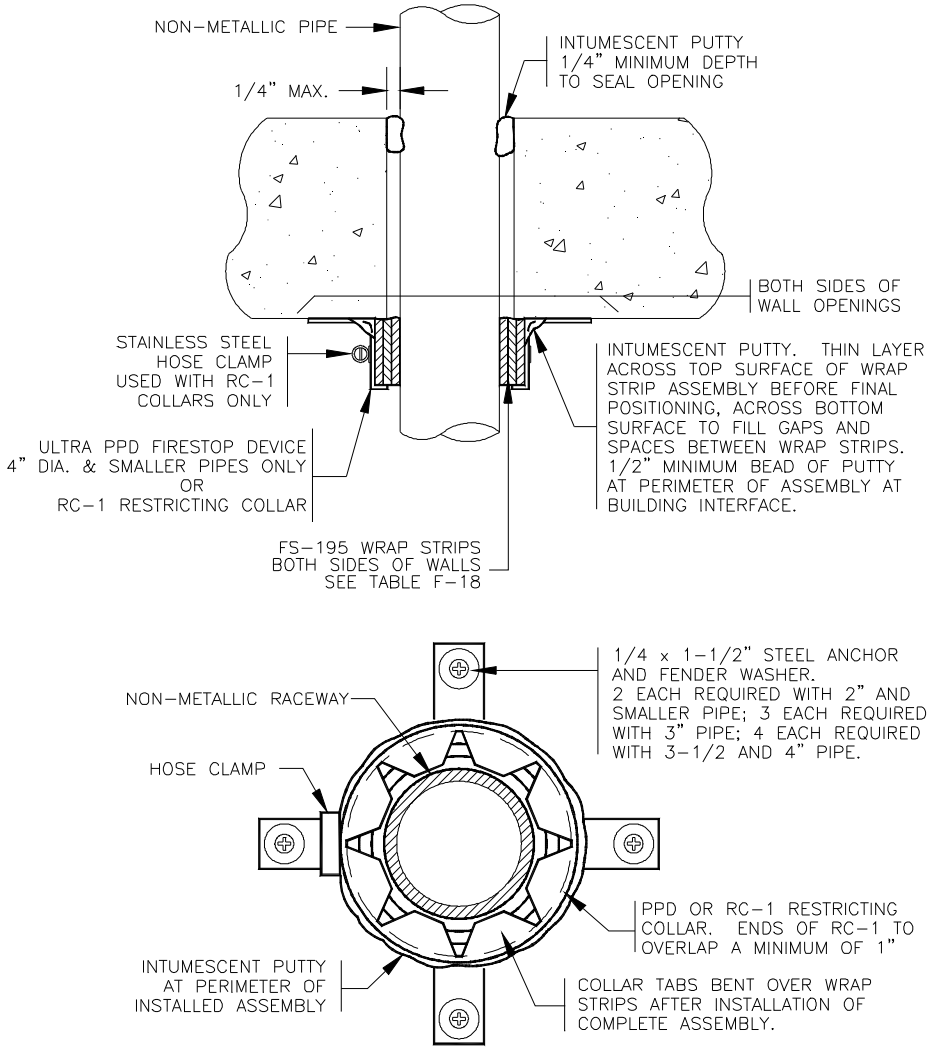


TABLE F-18

APPLICATION OF 3M FS-195 WRAP STRIP TO NON-METALLIC PIPES			
Pipe Size			No. of Wrap Strip Layers
PVC	ENT	SQ. or Rectangle	
1/2 to 2"	<1-1/2"	<3 Sq. In.	1
2-1/2 to 3"	1-1/2 to 2"	3 to 7 Sq. In.	2
3-1/4 to 4"	Bundles of <2" (7 max.)	>7 Sq. to 12-1/2 Sq. In.	3
6"		13 to 28 Sq. In.	2 Stacks of 3
8"		>28 Sq. In.	2 Stacks of 4

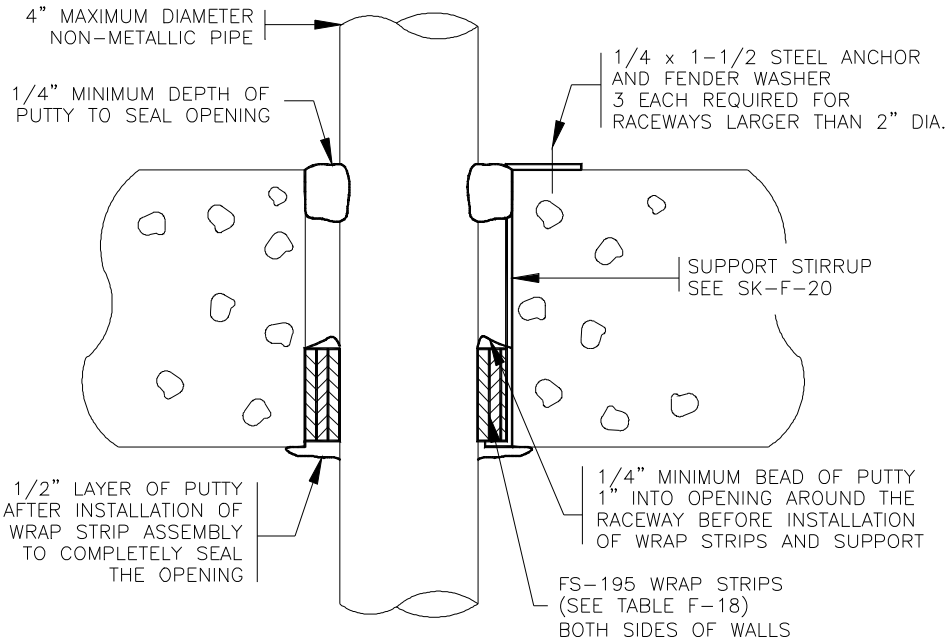
(revised – changed table ref. from F-19 to F-18 in collar descript. below ceiling)

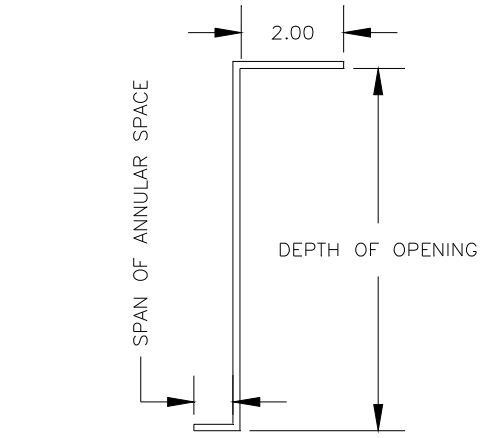
FIGURE F-19 – FIRE STOPPING NON-METALLIC PIPE UP TO 4" DIAMETER IN A 7" MAX. DIAMETER CIRCULAR OPENING IN SOLID/HOLLOW FLOORS AND WALLS (UL CAJ-2001, CAJ-2226, WL-2092)



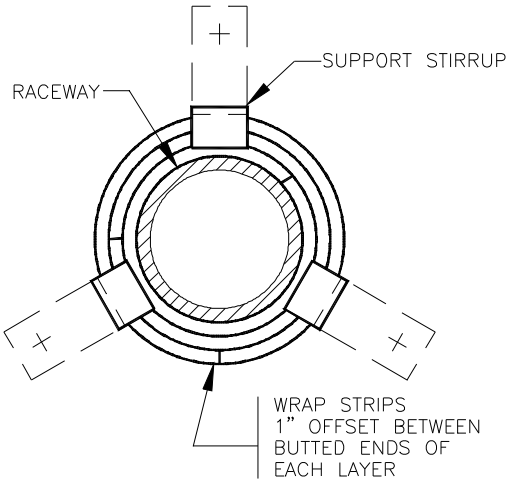
(REVISED – "BOTH SIDES OF WALLS AND TABLE F-18 REF. (TOP)

FIGURE F-20 - FIRE STOPPING NON-METALLIC PIPE UP TO 4" DIAMETER IN A 6" MAX. DIAMETER CIRCULAR OPENING IN CONCRETE/MASONRY FLOORS AND WALLS (UL CAJ-2002)





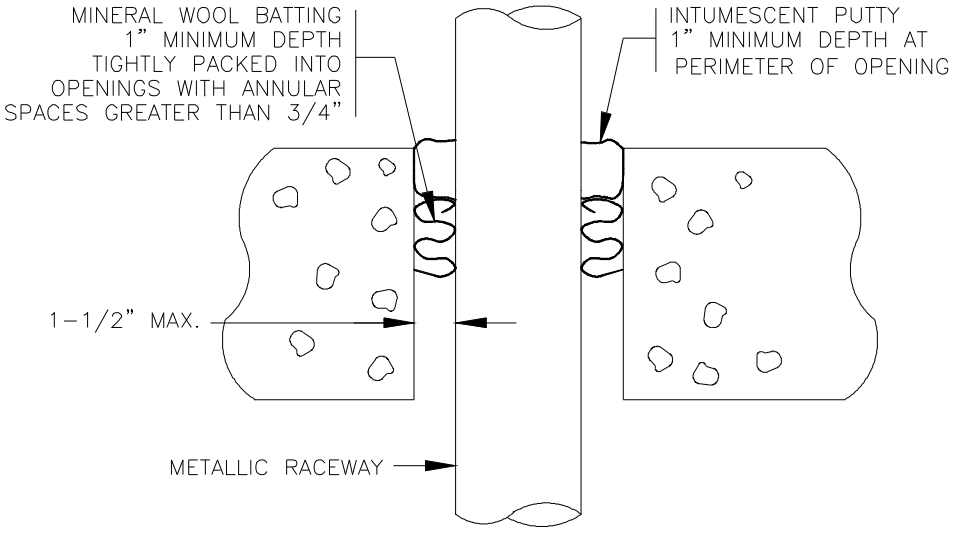
INSTALLER FABRICATED SUPPORT STIRRUP
1" x NO.28 GAUGE GALV STEEL
SK-F-20



VIEW FROM BELOW

(REVISED – TABLE F-18 & "BOTH SIDES OF WALLS" (TOP))

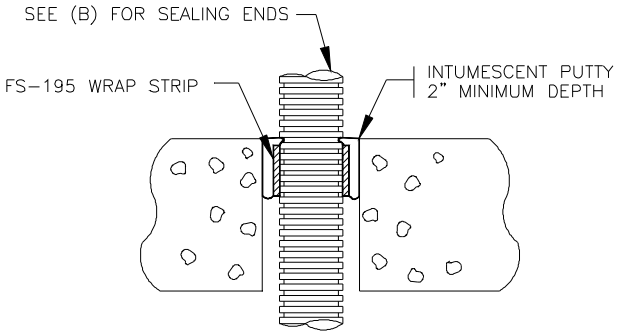
FIGURE F-21 – FIRE STOPPING METALLIC PIPE IN CIRCULAR OPENING OF CONCRETE/MASONRY FLOORS AND WALLS (UL CAJ-1027)



(Both Sides Of Walls)

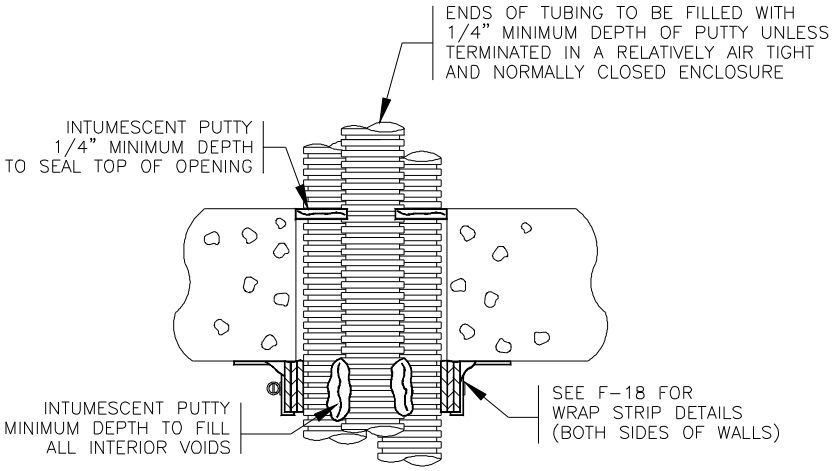
(REVISED – ADDED "BOTH SIDES OF WALL" TEXT BELOW FIGURE)

FIGURE F-22 – FIRE STOPPING FLEXIBLE NON-METALLIC TUBING IN CIRCULAR OPENINGS OF CONCRETE/MASONRY FLOORS AND WALLS (UL CAJ-2028 & CAJ-2029)



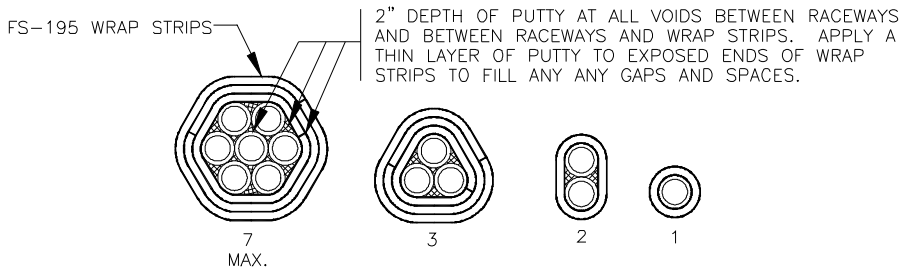
SINGLE RUN OF TUBING UP TO 2" IN DIAMETER
(BOTH SIDES OF WALLS)

(A)



MULTIPLE RUNS OF TUBING UP TO 2" IN DIAMETER IN A SINGLE OPENING

(B)



ASSEMBLY OF WRAP STRIPS ACCORDING TO NUMBER OF INSTALLED RACEWAYS

(C)

(REVISED – FIGURE F-18 REFERENCE)

FIGURE F-23 – FIRE STOPPING CABLE IN CIRCULAR OPENINGS OF HOLLOW WALLS (UL WL-3031)

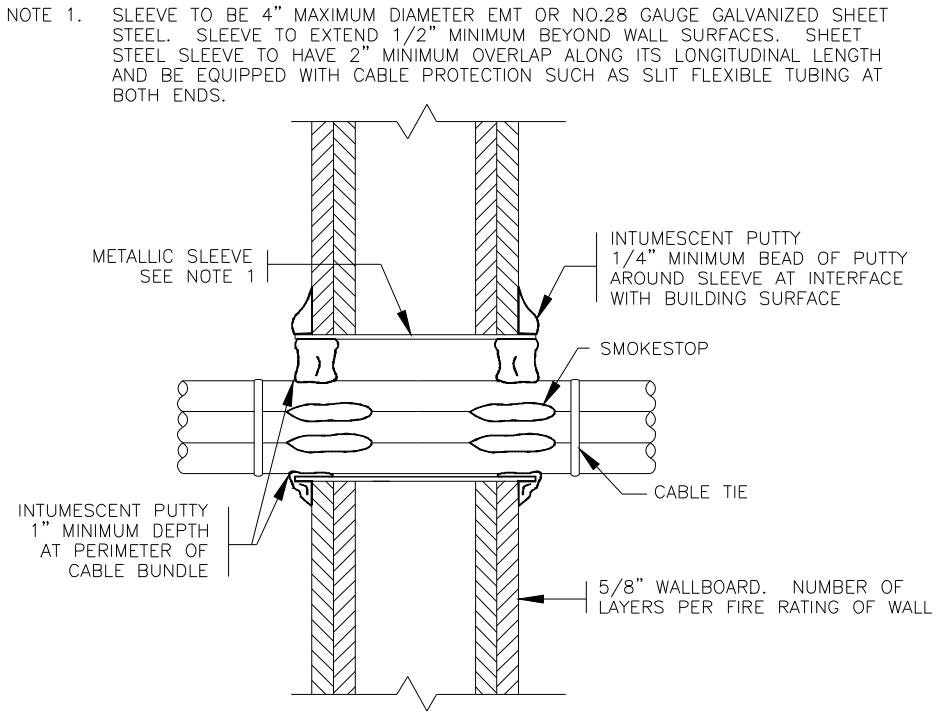


FIGURE F-24 – FIRE STOPPING 2" MAX. DIAMETER NON-METALLIC PIPE IN HOLLOW WALLS (UL WL-2097)

NOTE 1. SLEEVE TO BE 7" MAXIMUM DIAMETER EMT OR NO.28 GAUGE GALVANIZED SHEET STEEL. SLEEVE TO EXTEND 1/2" MINIMUM BEYOND WALL SURFACES. SHEET STEEL SLEEVE TO HAVE 2" MINIMUM OVERLAP ALONG ITS LONGITUDINAL LENGTH AND BE EQUIPPED WITH CABLE PROTECTION SUCH AS SLIT FLEXIBLE TUBING AT BOTH ENDS.

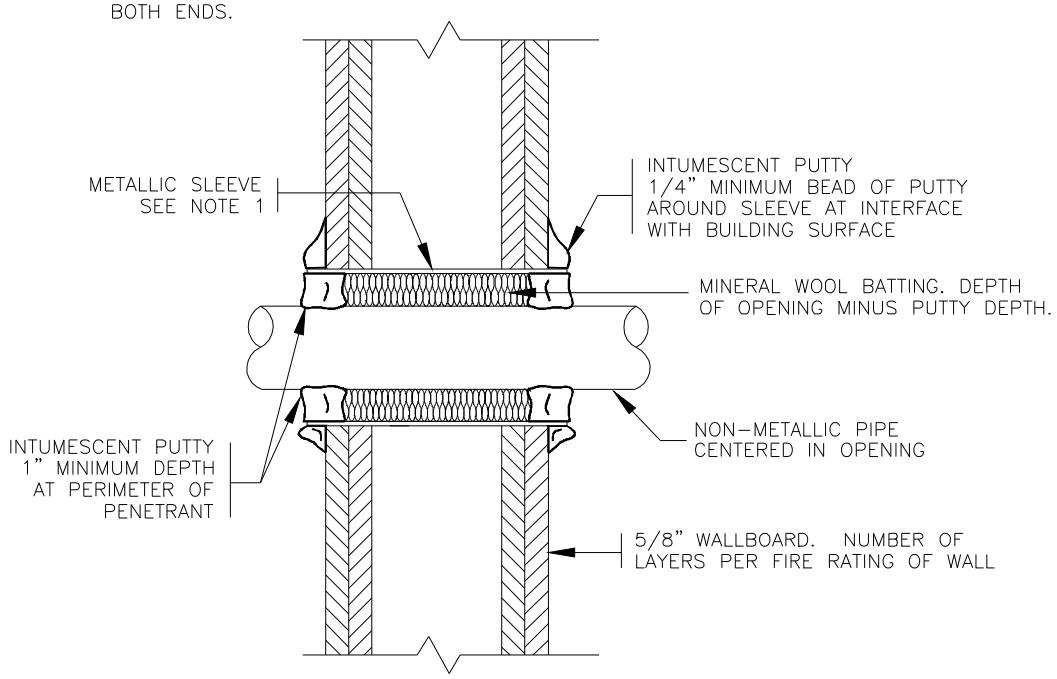


FIGURE F-25 – FIRE STOPPING METALLIC PIPE IN HOLLOW WALLS (UL WL-1001, WL-1032)

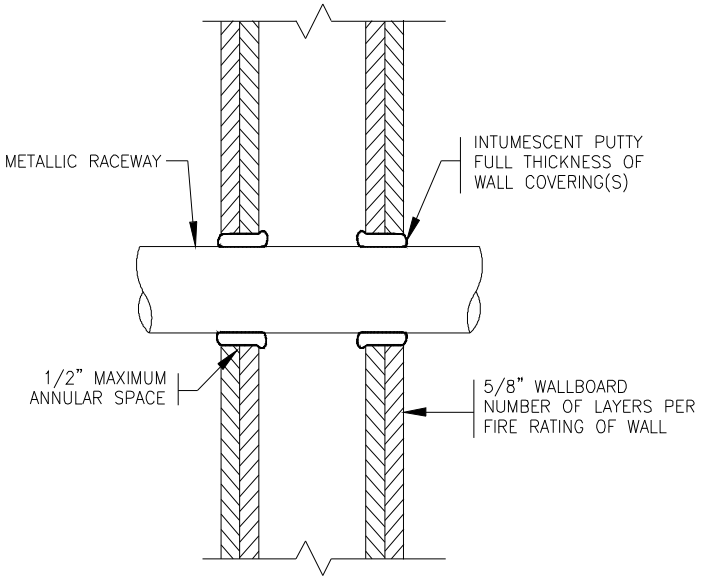
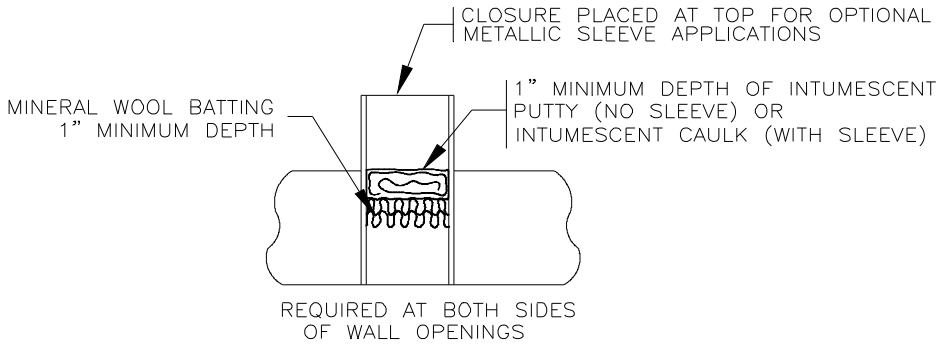
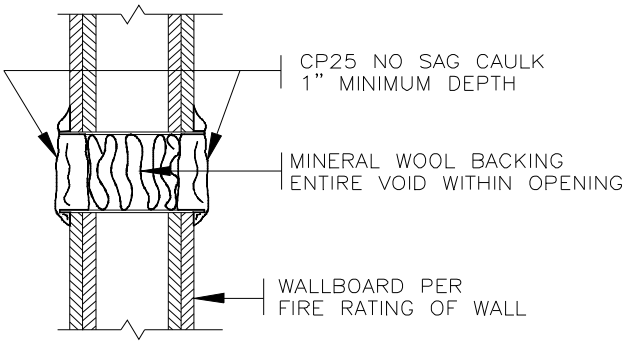


FIGURE F-26 – FIRE STOPPING VOID CIRCULAR OPENINGS IN FLOORS AND WALLS (UL WL-3031 EJ)



VOID CIRCULAR OPENING IN CONCRETE/MASONRY FLOOR AND WALLS

(A)

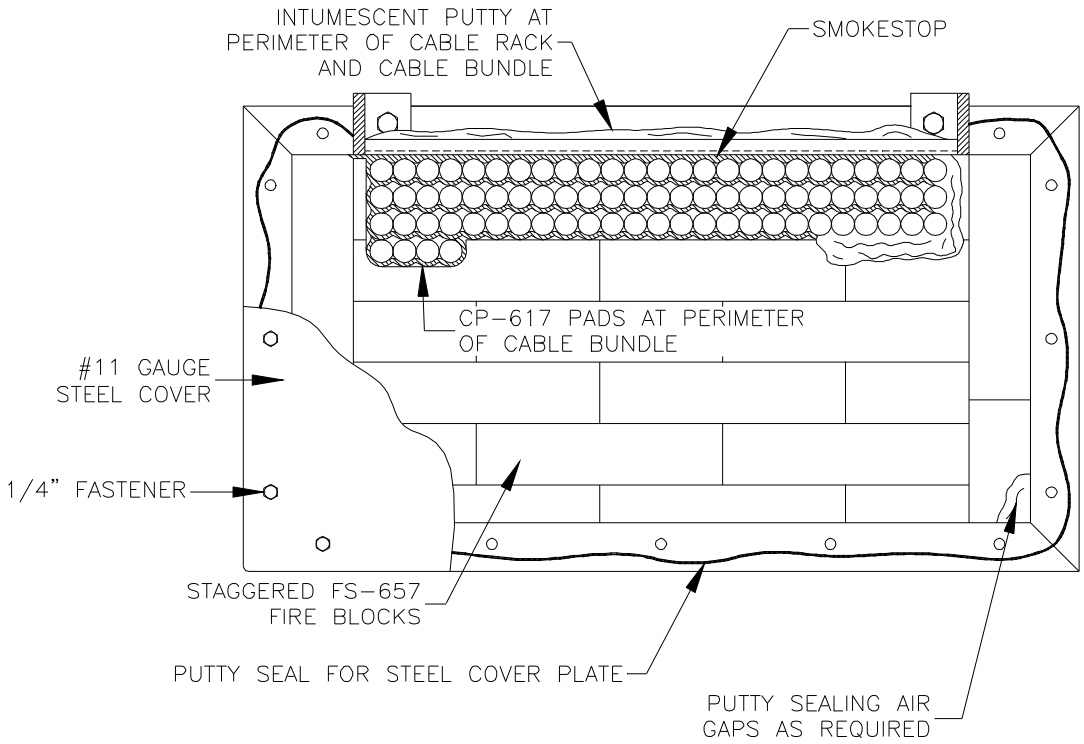


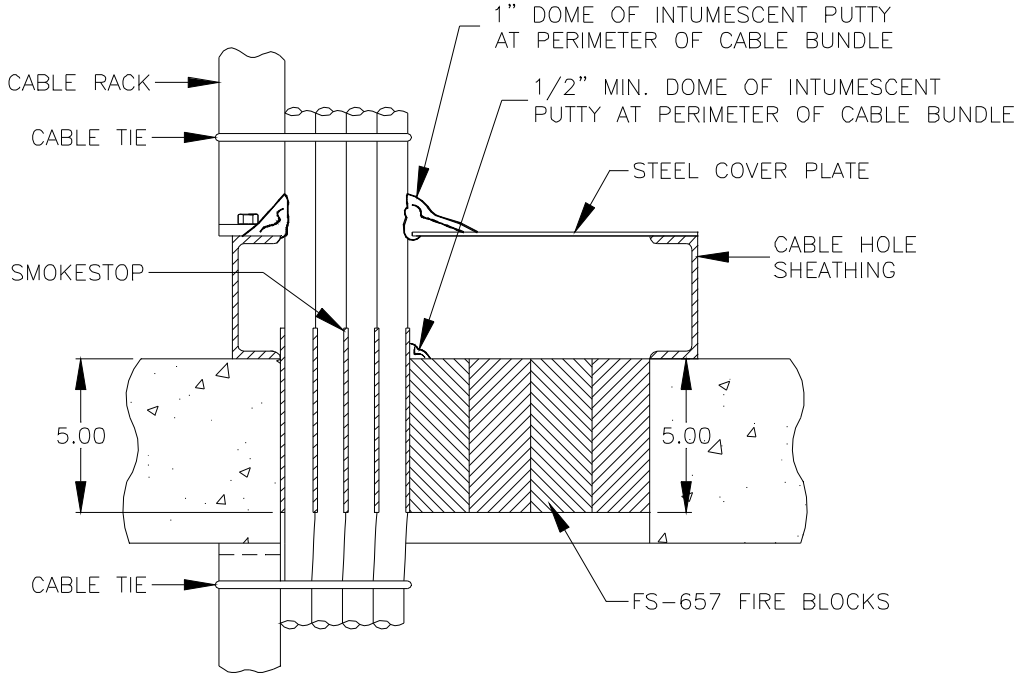
VOID CIRCULAR OPENING IN FRAMED WALLS

(B)

THIS SPACE IS RESERVED FOR FUTURE FIGURES F27 – F29

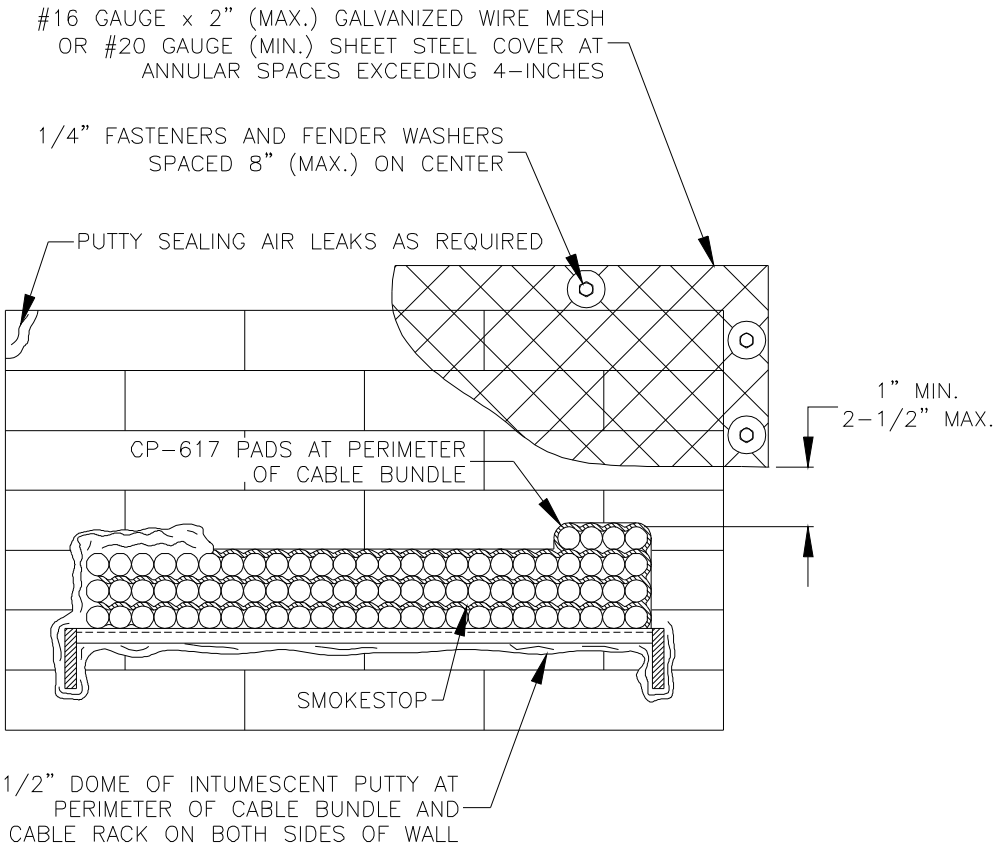
F-30 – FIRE STOPPING LARGE FLOOR OPENINGS USING INTUMESCENT FIRE BLOCKS (CBJ-8013)





(REVISED – ADDED STEEL COVER SANS FENDER WASHERS)

F-31 – FIRE STOPPING LARGE WALL OPENINGS USING INTUMESCENT FIRE BLOCKS (CBJ-8013)



(figure replacement IRCN 10-01-005 – plus I changed size of putty dome around cable to agree with 4.15.1 (1/2"))

FIGURE F-31B – FIRE STOPPING LARGE WALL OPENINGS USING HILTI FIRE STOP BOARD AND BLOCKS (UL WJ-4049)

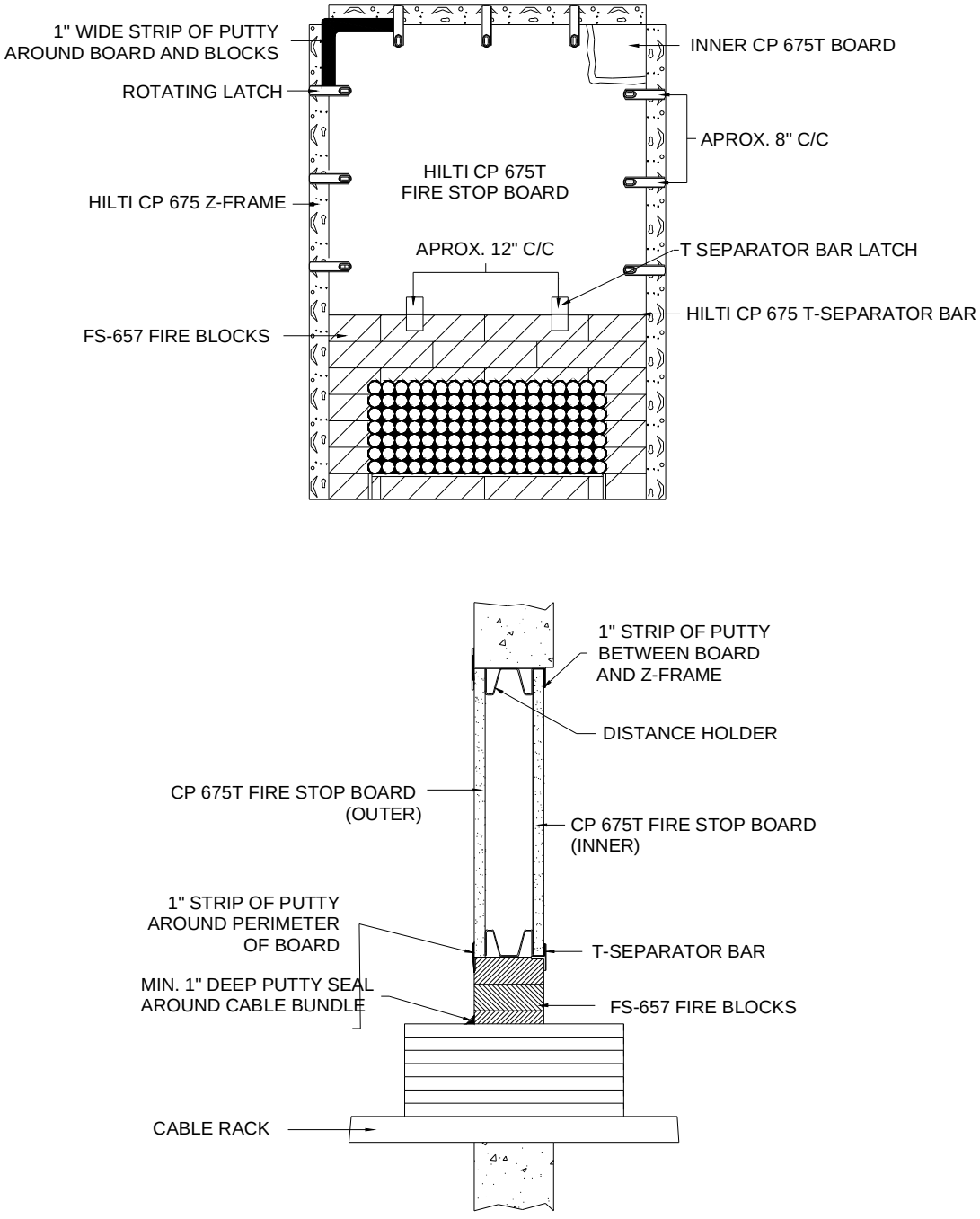
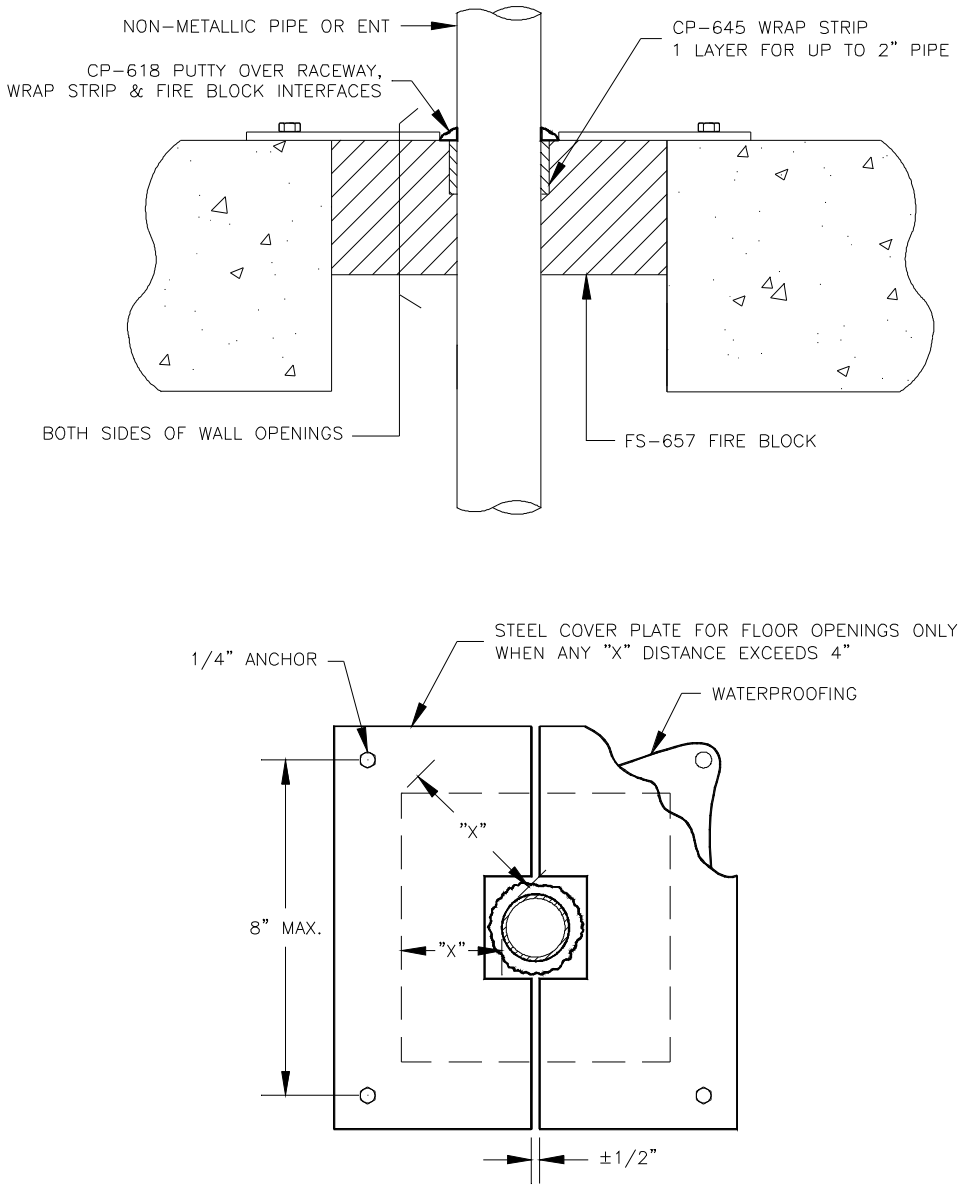
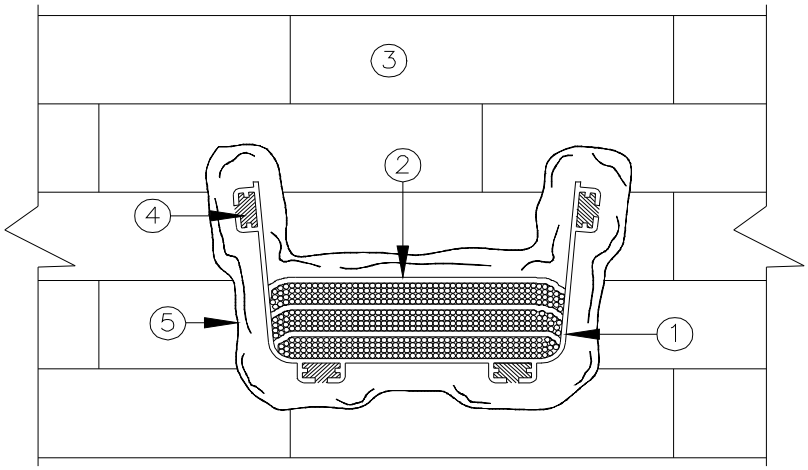


FIGURE F-32 – FIRE STOPPING NON-METALLIC PIPE AND TUBING IN RECTANGULAR OPENINGS USING INTUMESCENT FIRE BLOCKS (CBJ-8013)



(NEW – added wrap strip layer numbers)

FIGURE F-33 – FIRE STOPPING ADC FIBER TROUGH IN RECTANGULAR OPENINGS USING INTUMESCENT FIRE BLOCKS (WL-4039)



LEGEND

(1) ADC FIBERGUIDE RACEWAY UP TO 4 X 12" IN SIZE.

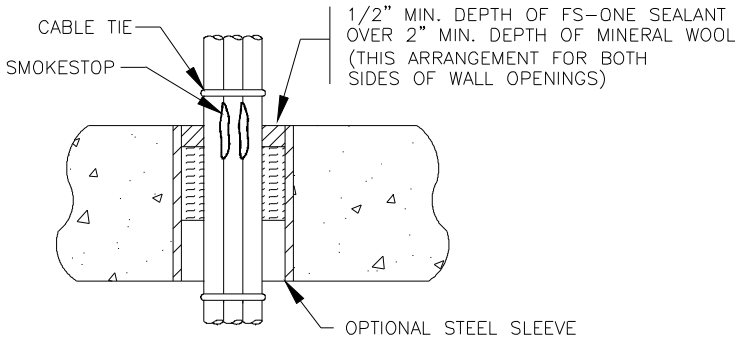
(2) CP–617 PUTTY PAD EVERY 1/2" OF PATCHCORD PILEUP OR EACH LAYER OF TIE CABLE. PADS TO EXTEND INTO OPENING A MINIMUM OF 5".

(3) FS–657 FIRE BLOCKS INSTALLED IN OVERLAPPING FASHION.

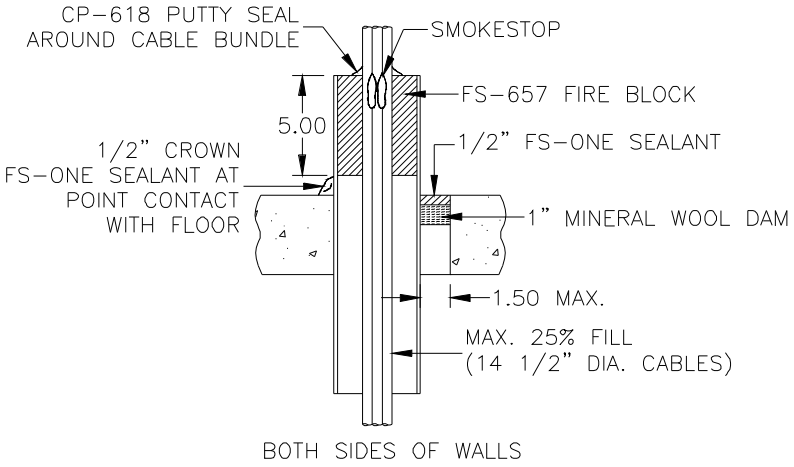
(4) MINIMUM 1" DEPTH OF CP–618 PUTTY AT INTERIOR OF RACEWAY SUPPORT CHANNELS.

(5) MINIMUM 1/2" DOME OF CP–618 PUTTY AROUND PERIMETER OF RACEWAY AT ITS INTERFACE WITH FIRE BLOCKS.

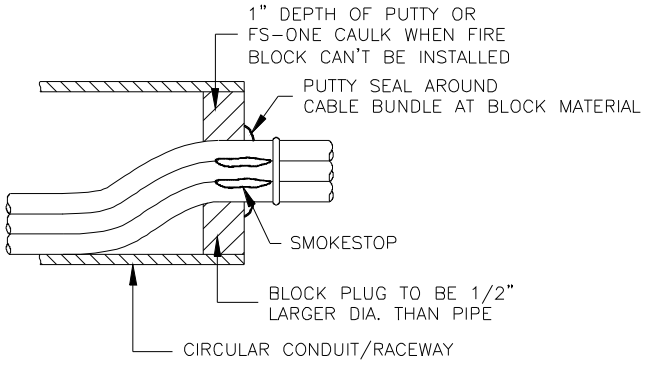
FIGURE F-34 – FIRE STOPPING CABLE IN 6" MAX. DIA. OPENING IN SOLID FLOORS AND WALLS (revised to add (B) & (C))



(A)
(CAJ-3095)



(B)
(CAJ-3152)



(C)
Conduit Dead-Ended Within Equipment Area

FIGURE F-35 – FIRE STOPPING CABLE IN 4" MAX. DIAMETER OPENING IN SOLID FLOORS AND WALLS EQUIPPED WITH NON-METALLIC SLEEVE (CAJ-3084)

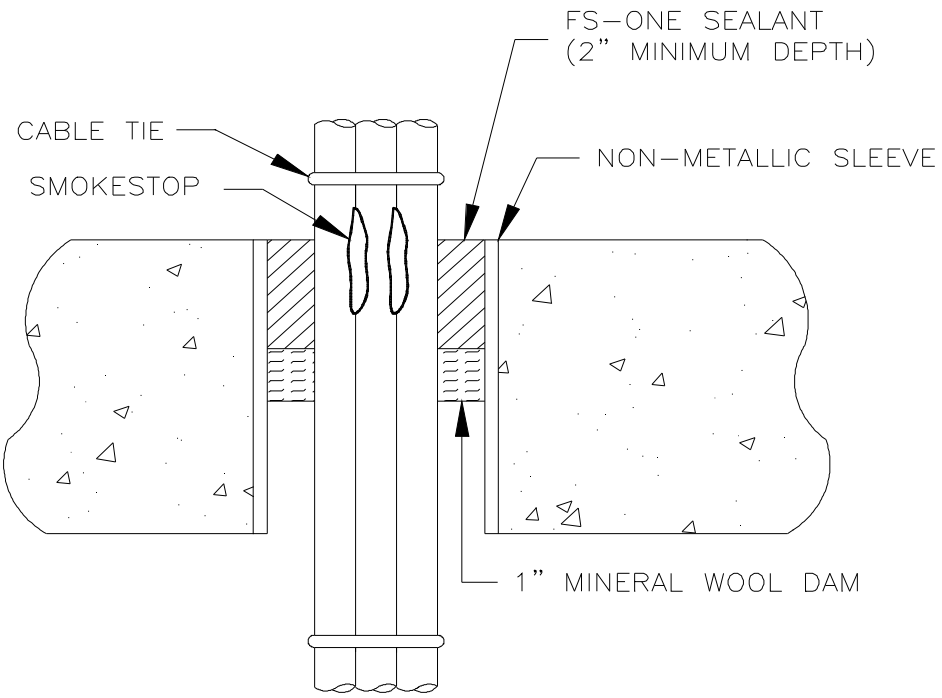


FIGURE F-36 – FIRE STOPPING CABLE IN 4" MAX. DIA. OPENING IN SOLID FLOORS AND WALLS EQUIPPED WITH NON-METALLIC SLEEVE EXTENDING BEYOND BUILDING SURFACE (CAJ-3084 EJ)

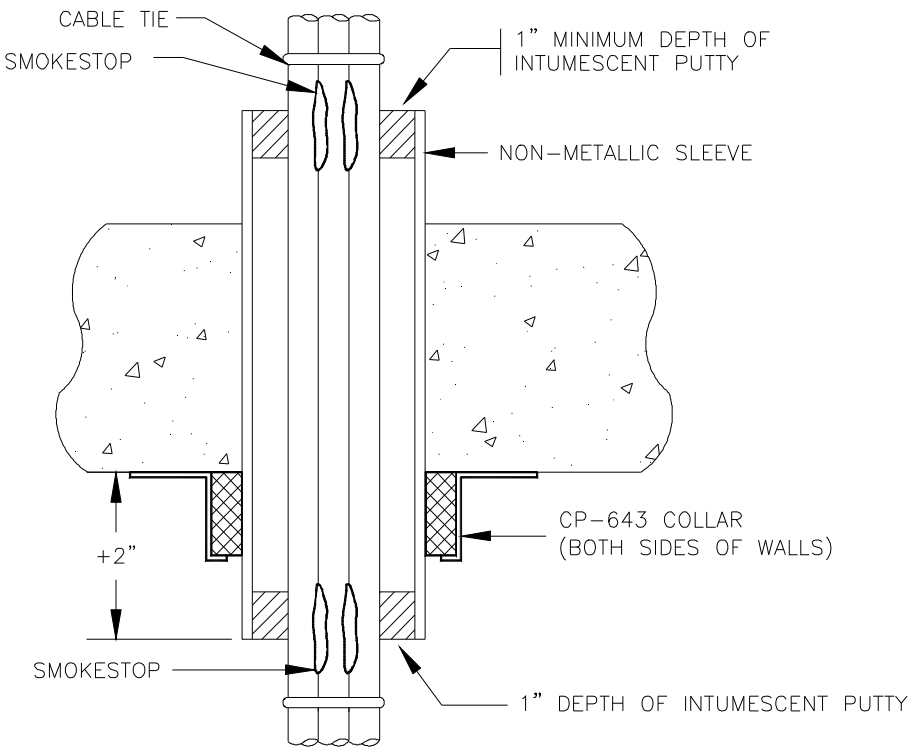


FIGURE F-37 – FIRE STOPPING NONMETALLIC PIPE 7" MAX. DIA. OPENING IN SOLID FLOORS AND WALLS – SMALL ANNULAR SPACE (CAJ-2109)

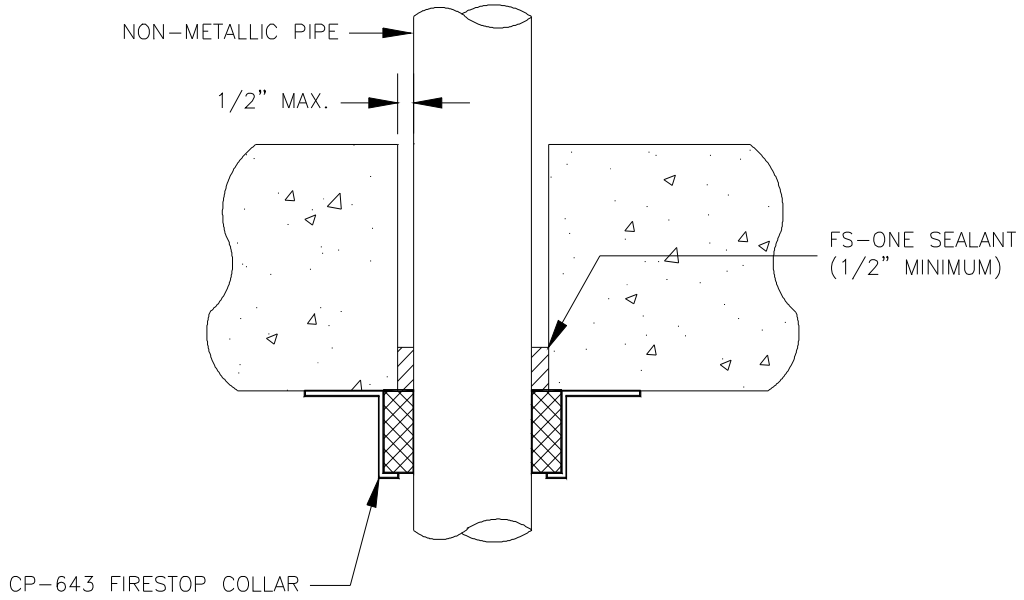


FIGURE F-38 – FIRE STOPPING NON-METALLIC PIPE IN 6" MAX. DIA. OPENING IN SOLID FLOORS AND WALLS – LARGE ANNULAR SPACE (CAJ-2294)

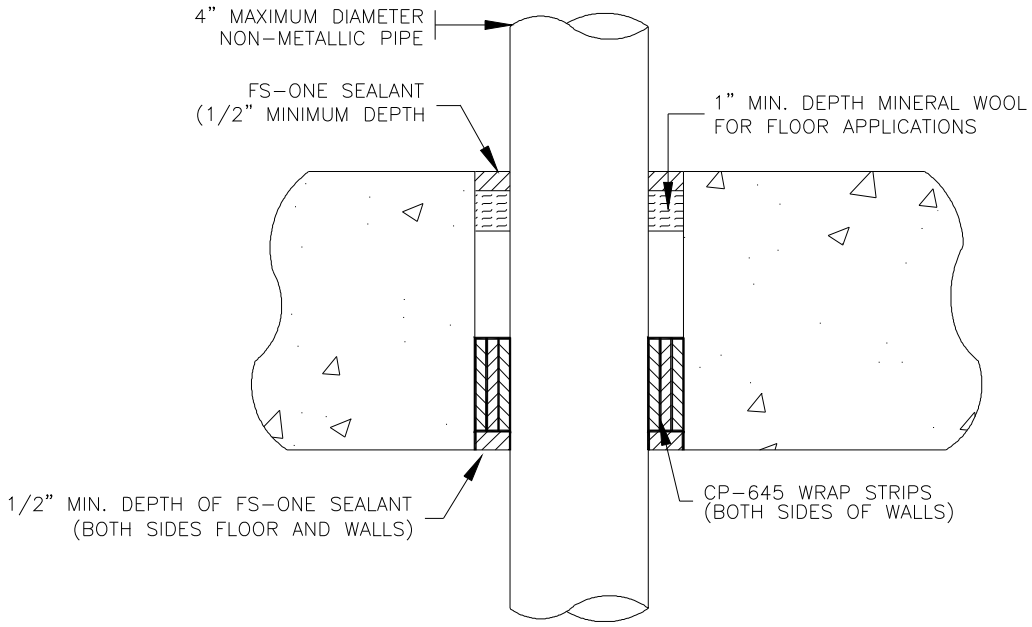
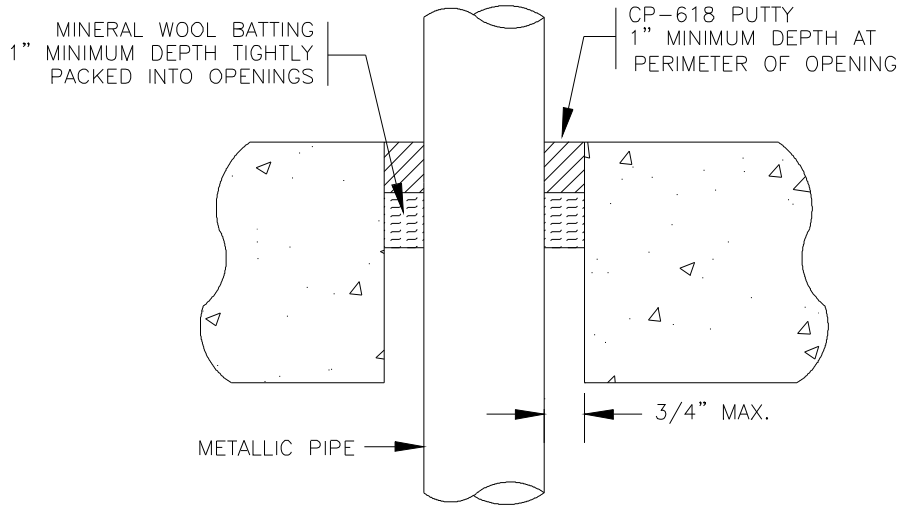
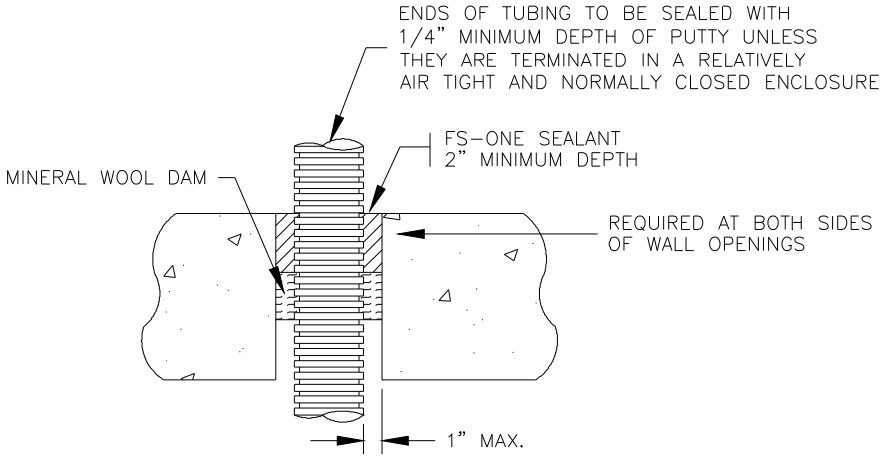


FIGURE F-39 – FIRE STOPPING METALLIC PIPE IN 6" MAX. DIA OPENING IN SOLID FLOORS AND WALLS – LARGE ANNULAR SPACE (CAJ-1276)



(3/4" annular reference added)

FIGURE F-40 – FIRE STOPPING ENT IN 4" MAX. DIA. OPENING IN SOLID FLOORS AND WALLS (CAJ-3084 EJ)



(added 1" annular reference)

FIGURE F-41 – FIRE STOPPING CABLE IN 4" MAX. DIA. OPENING IN HOLLOW WALLS (WL-3111, WL- 3112)

NOTE 1. SLEEVE TO BE 4" MAXIMUM DIAMETER EMT OR NO.28 GAUGE GALVANIZED SHEET STEEL AND EXTEND A MINIMUM OF 1/2" BEYOND WALL SURFACES.

SHEET STEEL SLEEVE TO HAVE A 2" MINIMUM OVERLAP ALONG ITS LONGITUDINAL LENGTH AND BE EQUIPPED WITH CABLE RPROTECTION SUCH AS A SLIT FLEXIBLE TUBING AT BOTH ENDS.

EMT SLEEVE TO BE PERMANENTLY GROUTED INTO OPENING. GROUT TO BE SAME THICKNESS OF WALLBOARD COVERING.

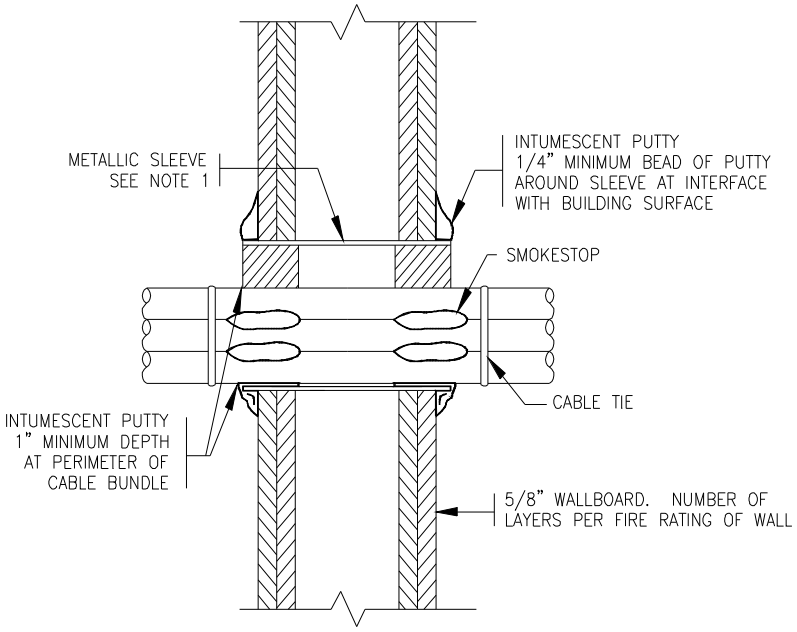
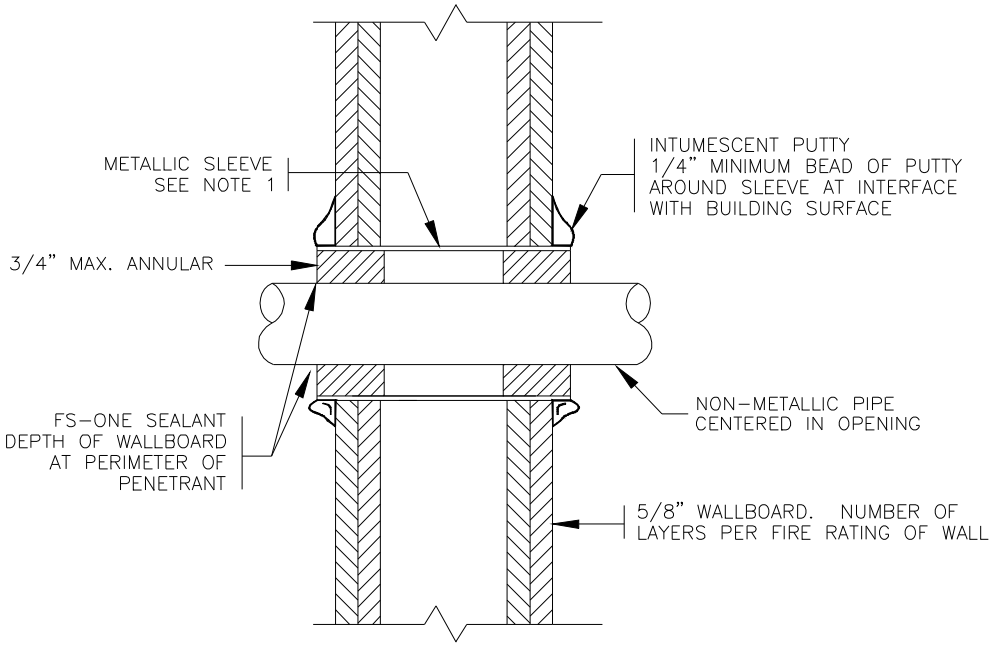


FIGURE F-42 – FIRE STOPPING NON-METALLIC PIPE IN 4" MAX. DIA. OPENING IN HOLLOW WALLS (WL-2075)

NOTE 1. SLEEVE TO BE 4" MAXIMUM DIAMETER EMT OR NO.28 GUAGE SHEET STEEL. SLEEVE TO EXTEND A MINIMUM OF 1/2" BEYOND WALL SURFACES.

SHEET STEEL SLEEVE TO HAVE A MINIMUM 2" OVERLAP ALONG ITS LONGITUDINAL LENGTH AND BE EQUIPPED WITH CABLE PROTECTION SUCH AS SLIT FLEXIBLE TUBING AT BOTH ENDS.

EMT SLEEVE TO BE PERMANENTLY GROUTED INTO OPENING. GROUT TO BE AS THICK AS WALLBOARD COVERING.



(ADDED 3/4" MAX ANNULAR REFERENCE)

FIGURE F-43 – FIRE STOPPING METALLIC RACEWAYS IN HOLLOW WALLS (EJ)

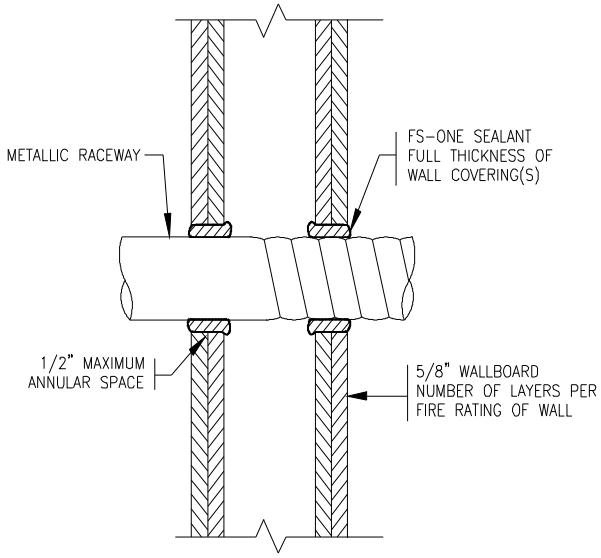
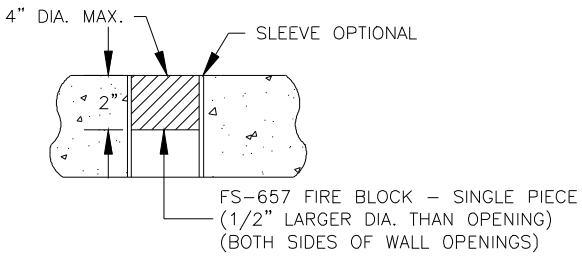
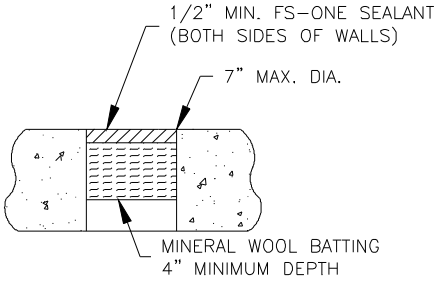


FIGURE F-44 – FIRE STOPPING VOID CIRCULAR OPENINGS IN FLOORS AND WALLS



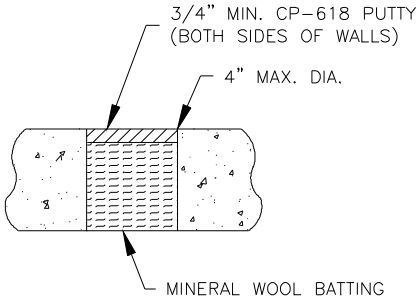
CAJ-0055EJ

(A)



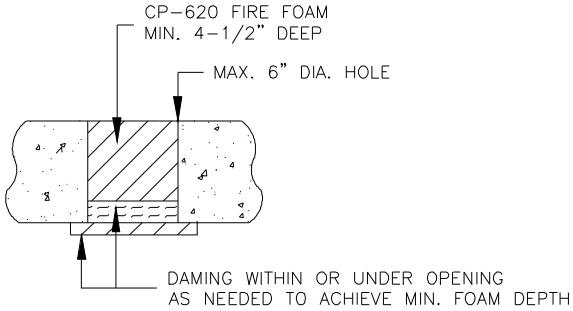
CAJ-0070

(B)



CAJ-0058

(C)



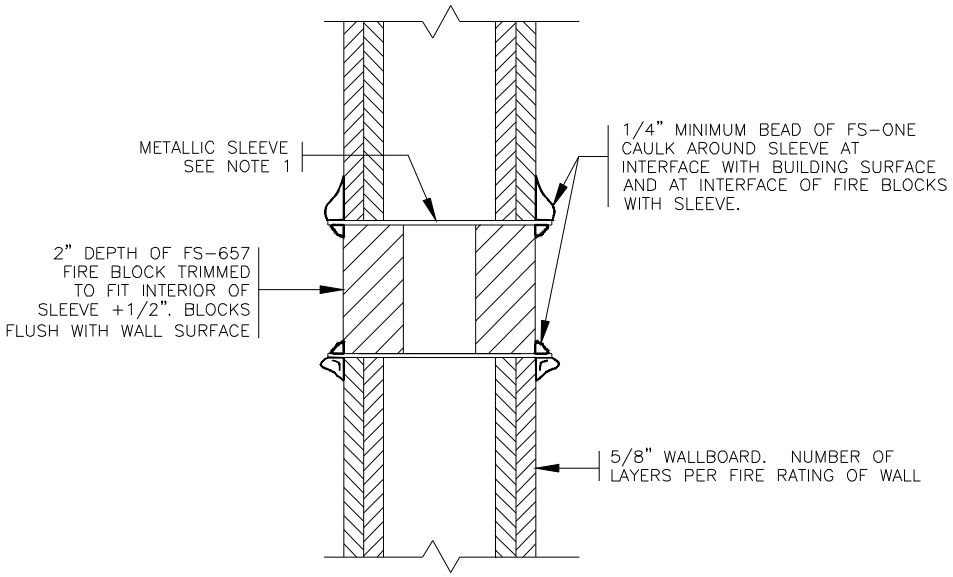
EJ 26529b

(D)

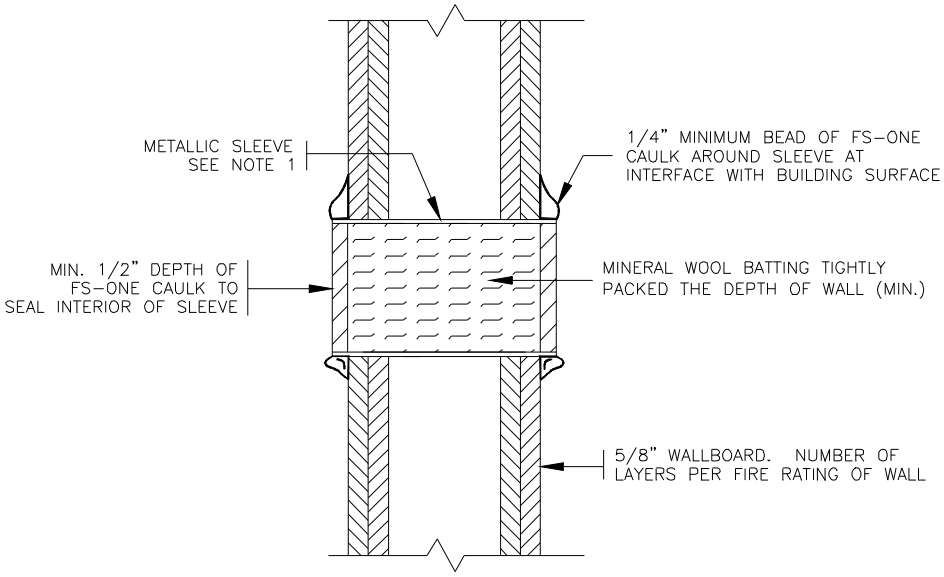
NOTE 1. SLEEVE TO BE 4" MAXIMUM DIAMETER EMT OR NO.28 GUAGE SHEET STEEL. SLEEVE TO EXTEND A MINIMUM OF 1/2" BEYOND WALL SURFACES.

SHEET STEEL SLEEVE TO HAVE A MINIMUM 2" OVERLAP ALONG ITS LONGITUDINAL LENGTH.

EMT SLEEVES TO BE PERMANENTLY GROUTED INTO OPENING. GROUT TO BE AS THICK AS WALLBOARD COVERING.



HILTI EJ 28652a



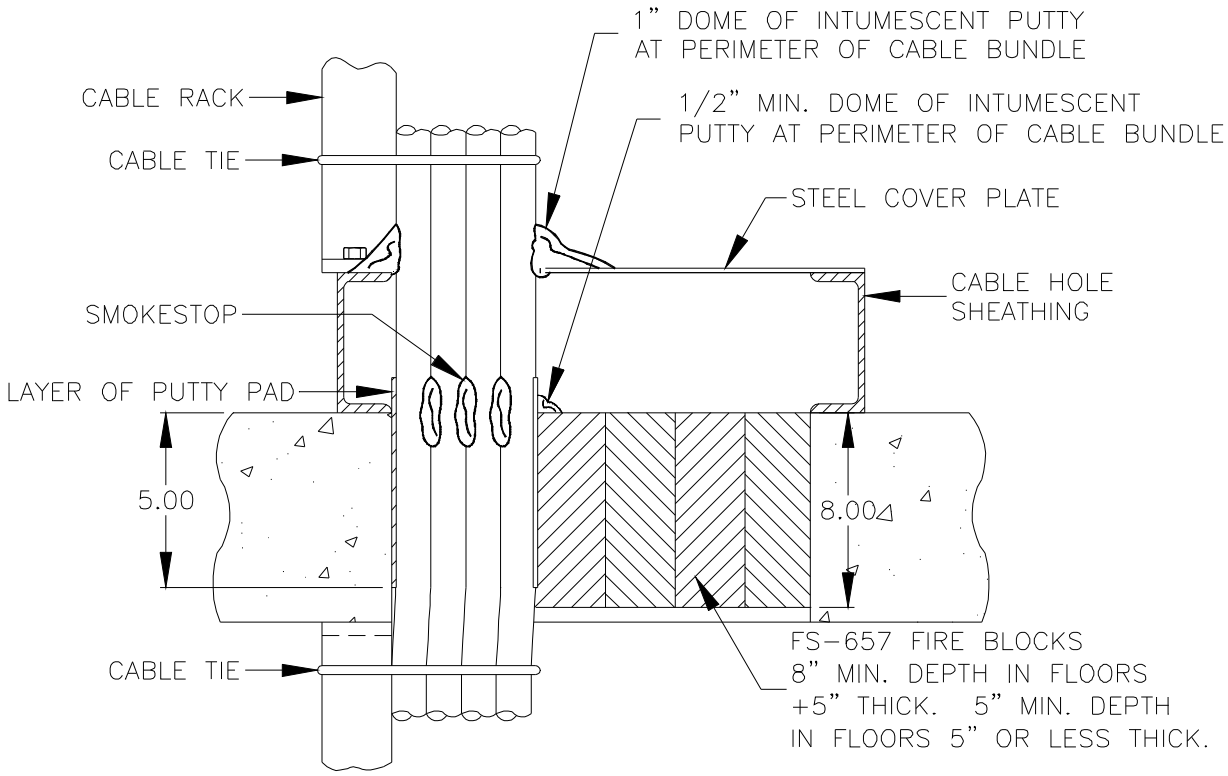
HILTI EJ 28653a

(E)

HOLLOW WALLS

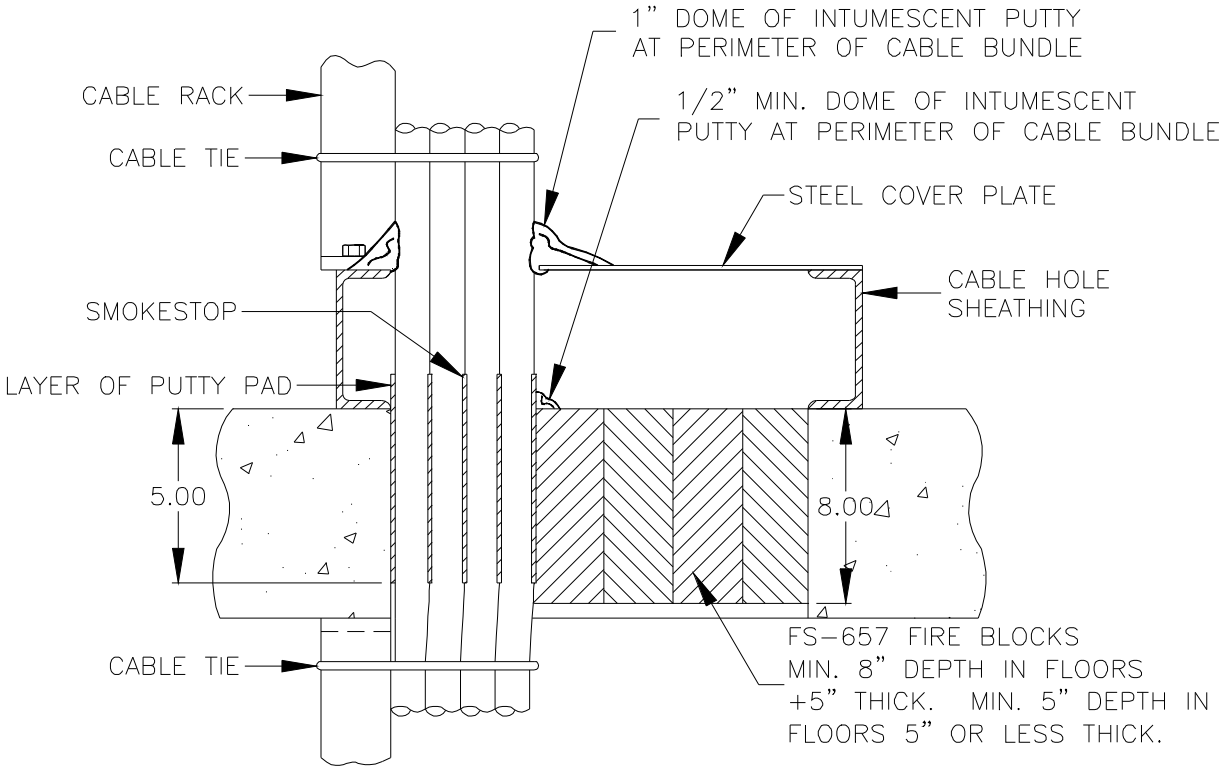
(ADDED "(D)" FOR FOAM APPLICATIONS and "(E)" for hollow walls)

FIGURE F-45 – FIRE STOPPING LARGE POWER CABLE ONLY OPENINGS IN FLOORS USING INTUMESCENT FIRE BLOCKS (CBJ-4026)



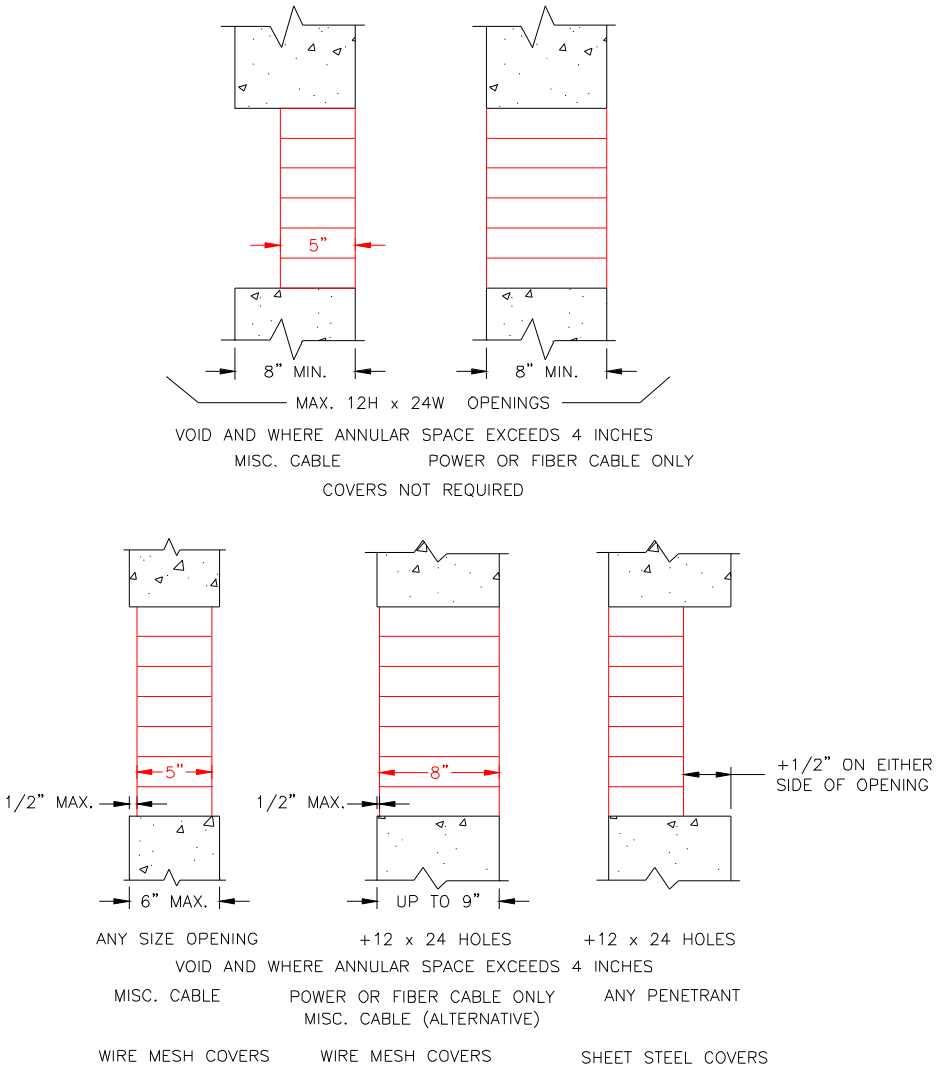
(NEW FIGURE - PLUS I ADDED "LAYER OF PUTTY PAD" BEHIND CABLE BUNDLE AND DEFINED BLOCK THICKNESS AT THIN FLOORS)

FIGURE F-46 – FIRE STOPPING LARGE FIBER CABLE ONLY OPENINGS IN FLOORSUSING INTUMESCENT FIRE BLOCKS (CBJ-4026)



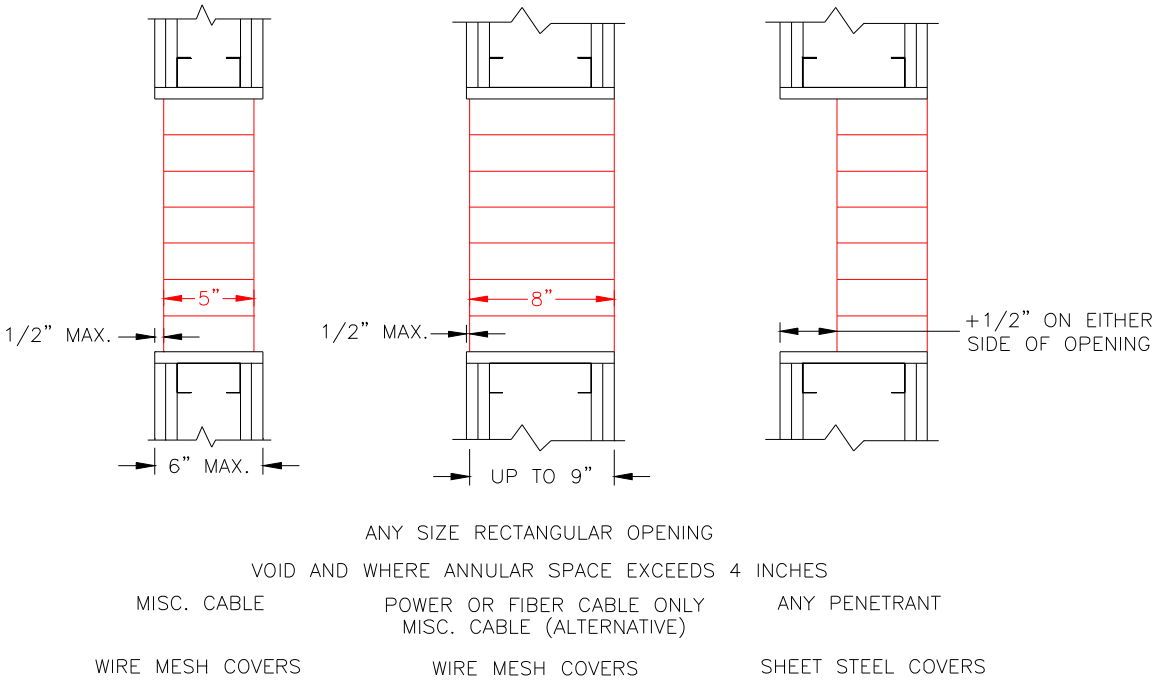
(NEW FIGURE – SAME REASONING AS F-45)

FIGURE F-47 – TYPICAL ORIENTATION OF HILTI FIRE BLOCKS AT VARIOUS WALL CONSTRUCTIONS



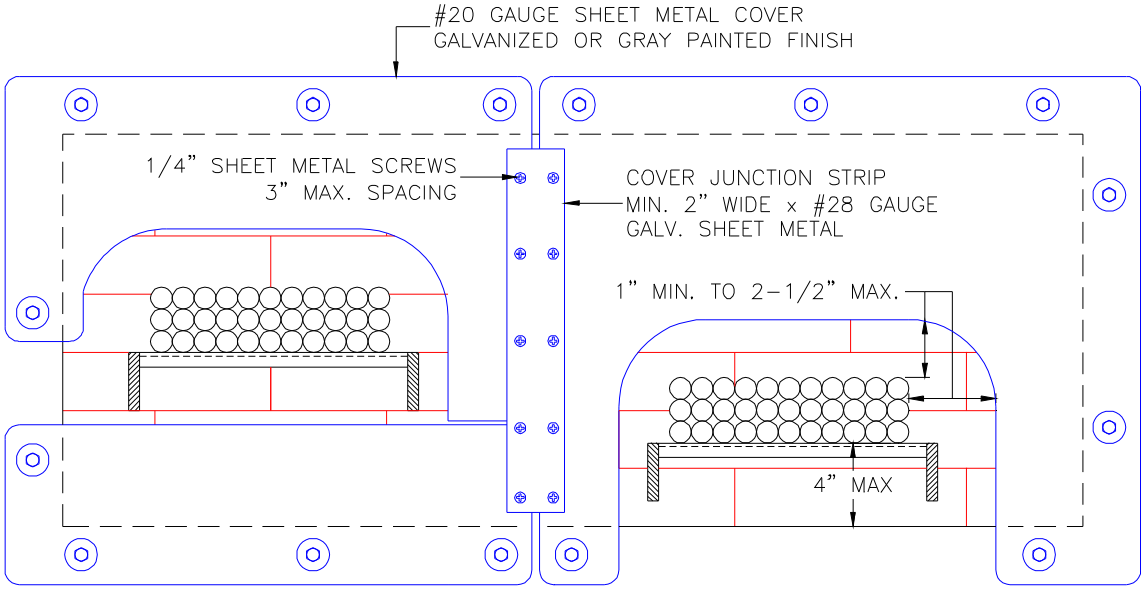
(A)
Concrete and Solid Filled Block Constructions

FIGURE F-47 – Continued

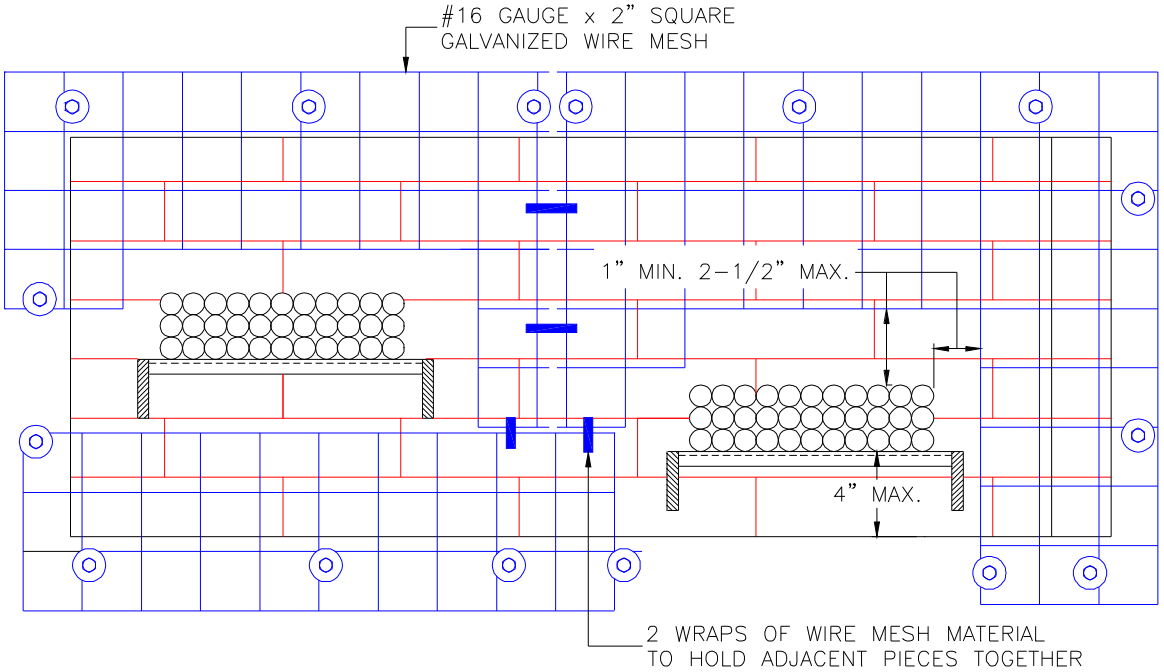


(B)
Hollow Wall Constructions

FIGURE F-48 – TYPICAL COVER JUNCTIONING AT LARGE WALL OPENINGS

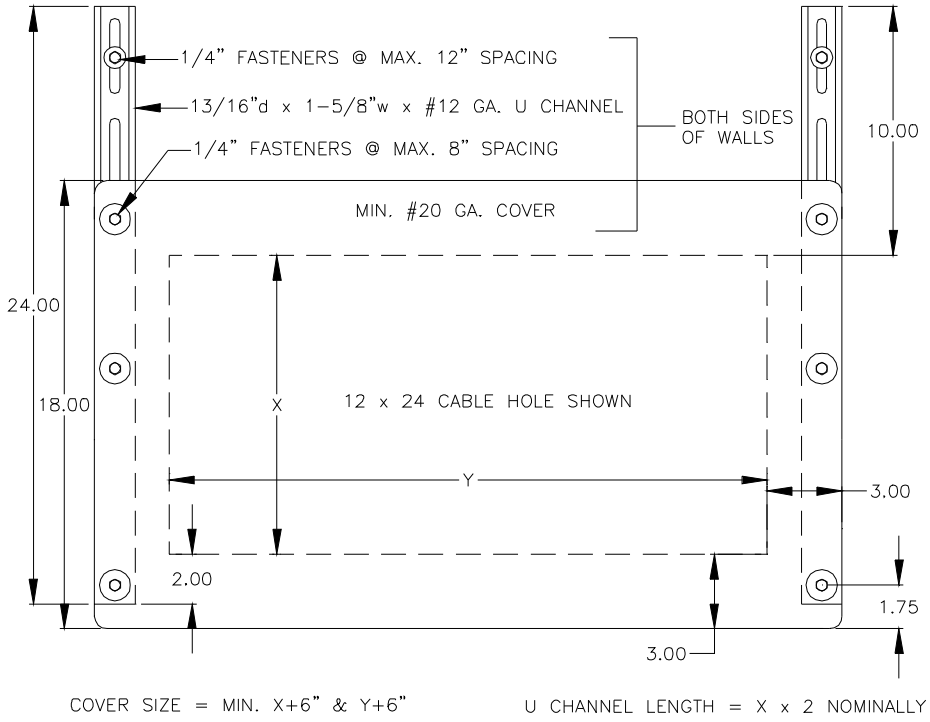


(A)
Solid Covers

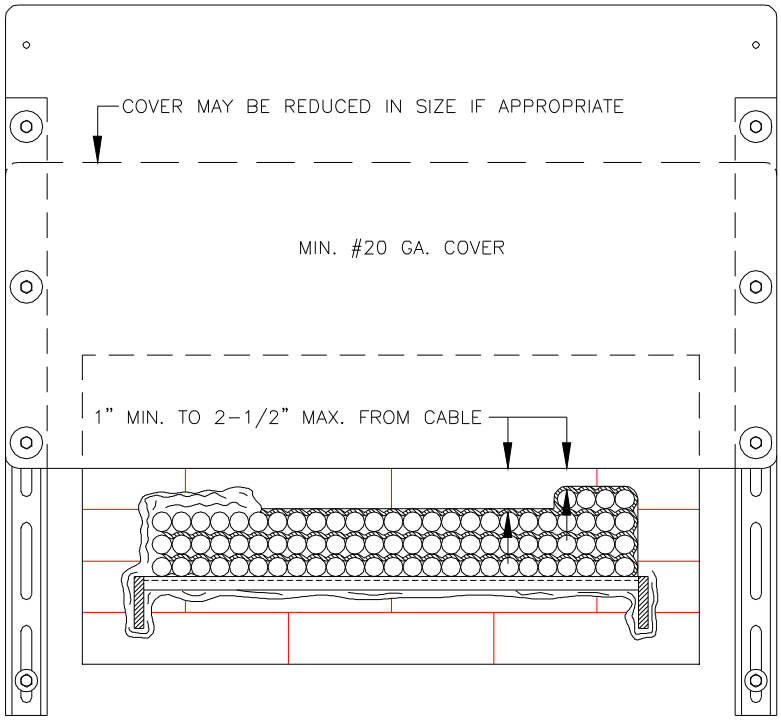


(B)
Mesh Covers

FIGURE F-49 – GENERAL APPLICATION OF HILTI STRUT COVER SUPPORTS (SINGLE HOLES ONLY)

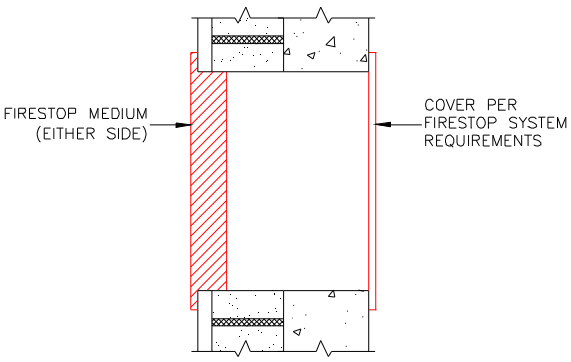


(A)
Void Cable Holes

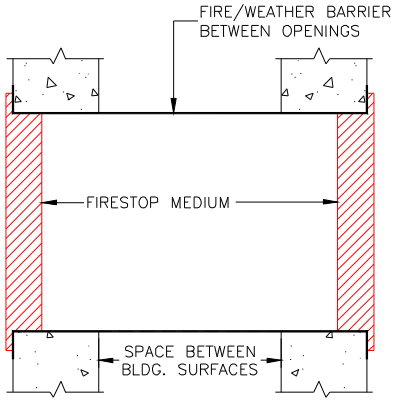


(B)
Occupied Cable Holes

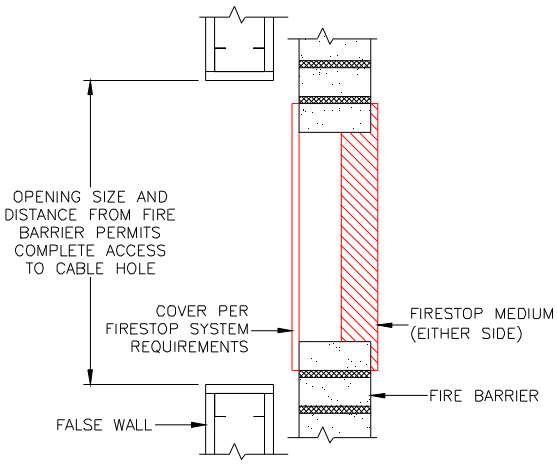
FIGURE F-50 – GENERAL APPLICATION OF FIRE STOPS AT ADJACENT BUILDING WALLS



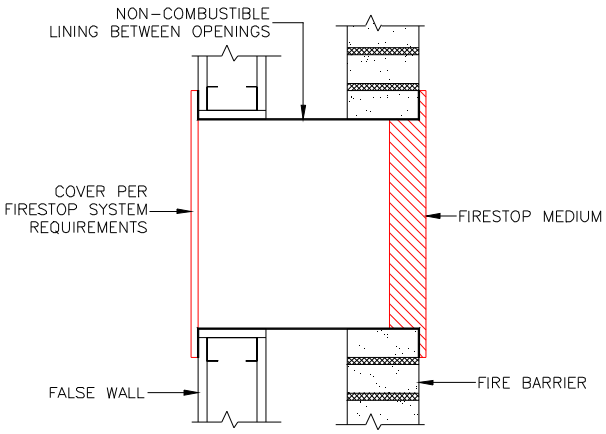
FIRESTOPPED AS SINGLE ENTITY
ABUTTING FIRE BARRIER SURFACES
(A)



FIRESTOPPED AS INDIVIDUAL ENTITIES
NON–ABUTTING FIRE BARRIER SURFACES
(B)

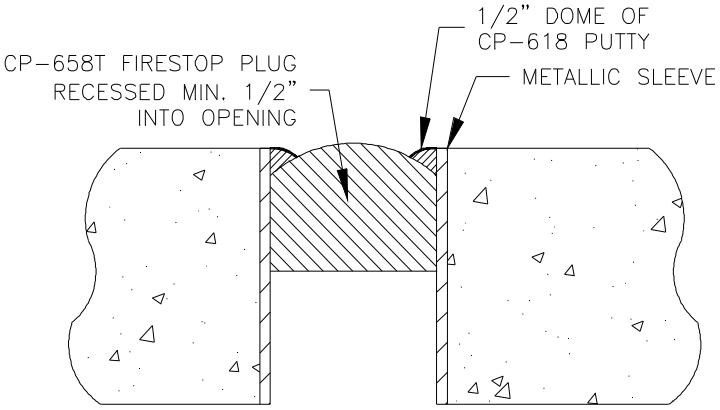


FALSE WALL CONSTRUCTIONS
UNRESTRICTED ACCESS TO FIRE BARRIER
(C)



FALSE WALL CONSTRUCTIONS
RESTRICTED ACCESS TO FIRE BARRIER
(D)

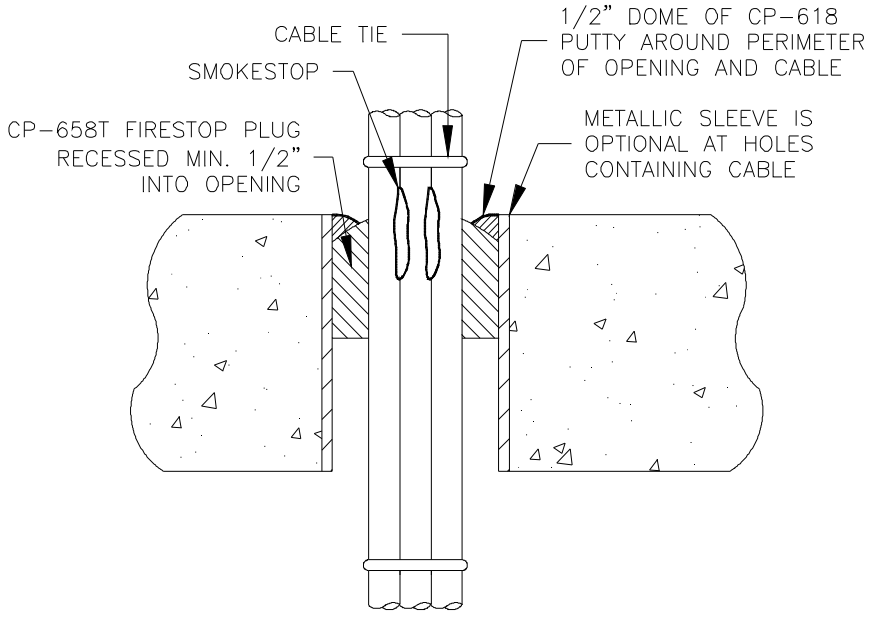
FIGURE F-51 – FIRE STOPPING CIRCULAR OPENINGS UP TO 4" IN DIA. IN FLOORS/WALLS USING HILTI CP-658T FIRE STOP PLUGS (CAJ-0097 and CAJ-3216)



BOTH SIDES OF WALLS

VOID OPENINGS

(A)



BOTH SIDES OF WALLS

OPENINGS WITH CABLE

(B)

FIGURE F-52 – BUILDING SERVICES WALL OPENING FIRE STOPPING (W-J-4049)

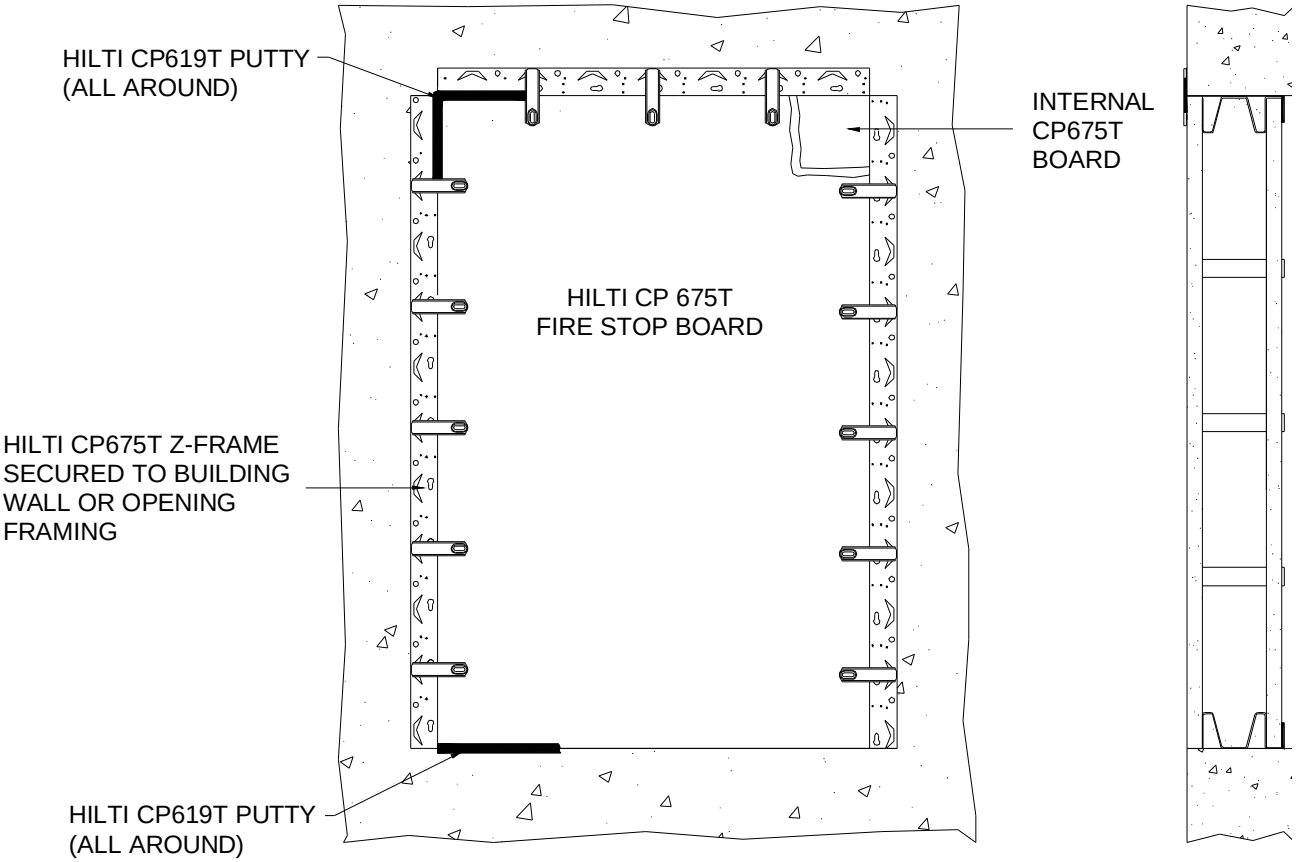
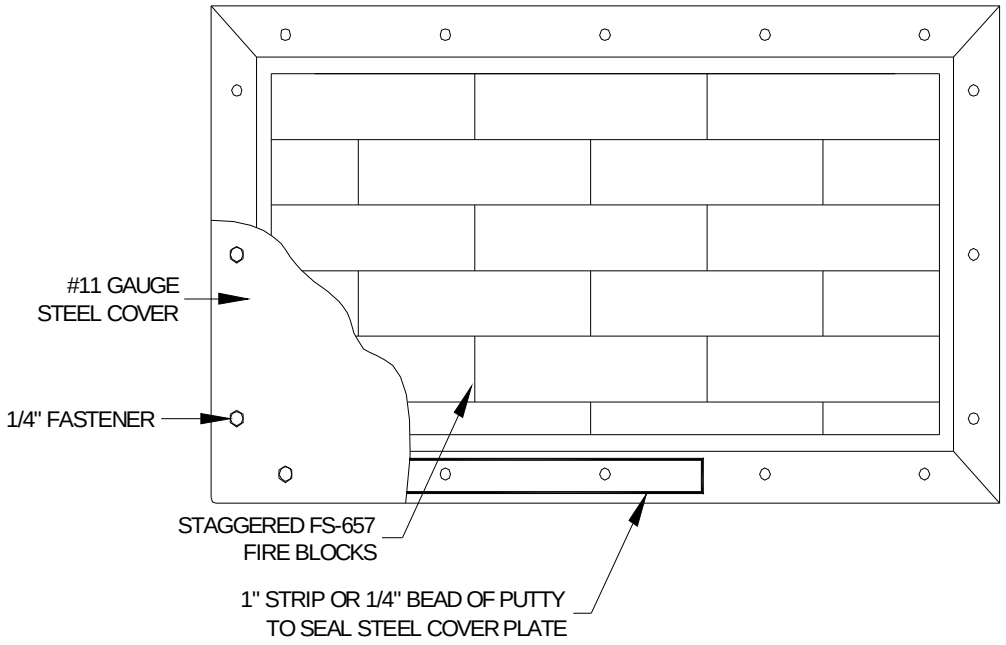


FIGURE F-53 – BUILDING SERVICES FLOOR OPENING FIRE STOPPING (C-BJ-4026)



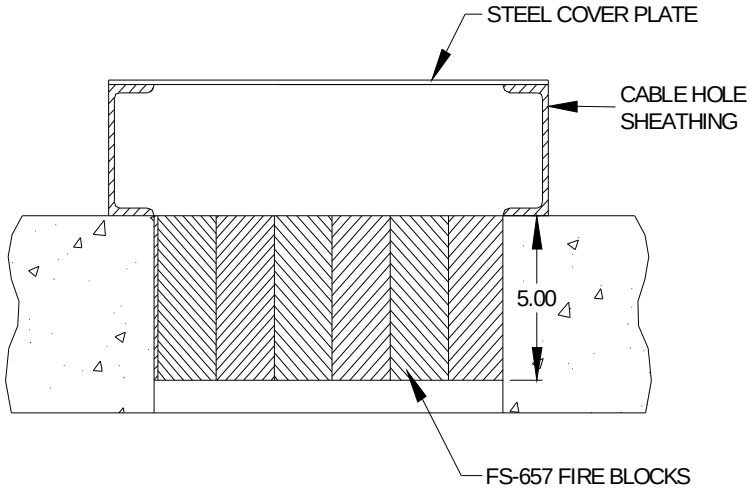
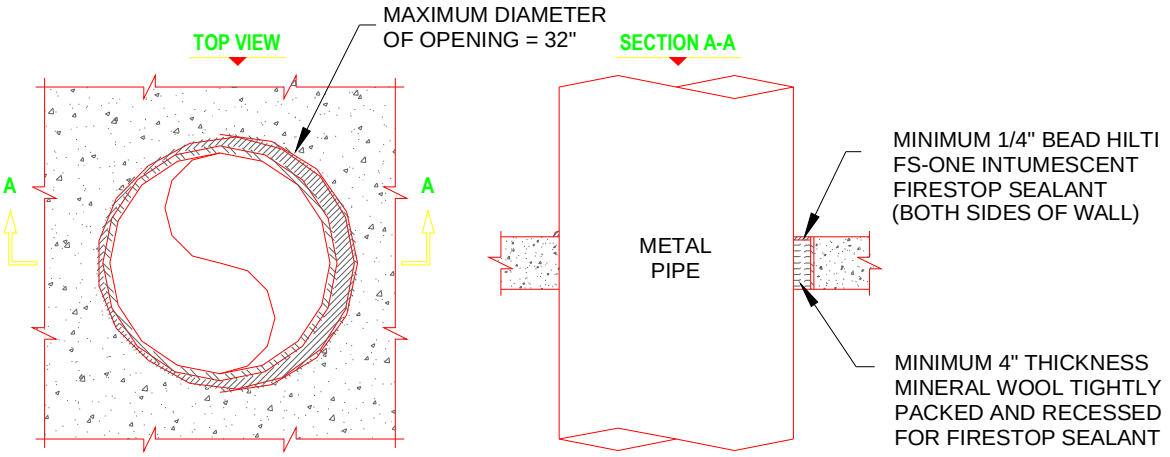
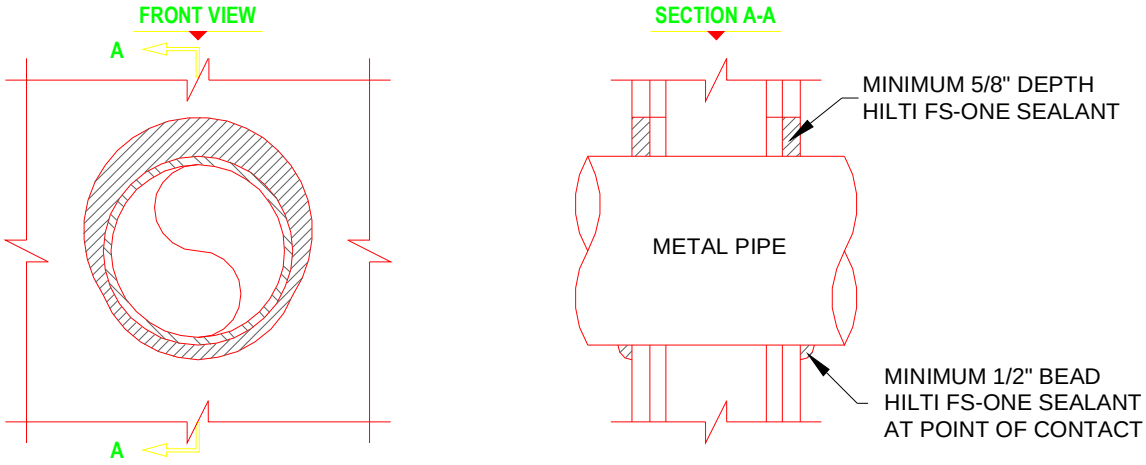


FIGURE F-54 – BUILDING SERVICES PIPE THROUGH WALL/FLOOR



PENETRATING ITEM TO BE ONE OF THE FOLLOWING:
A. MAXIMUM 30" NOMINAL DIAMETER STEEL PIPE (SCHEDULE 10 OR HEAVIER)
B. MAXIMUM 30" NOMINAL DIAMETER CAST IRON PIPE
C. MAXIMUM 6" NOMINAL DIAMETER COPPER PIPE
D. MAXIMUM 6" NOMINAL DIAMETER STEEL CONDUIT
E. MAXIMUM 4" NOMINAL DIAMETER EMT

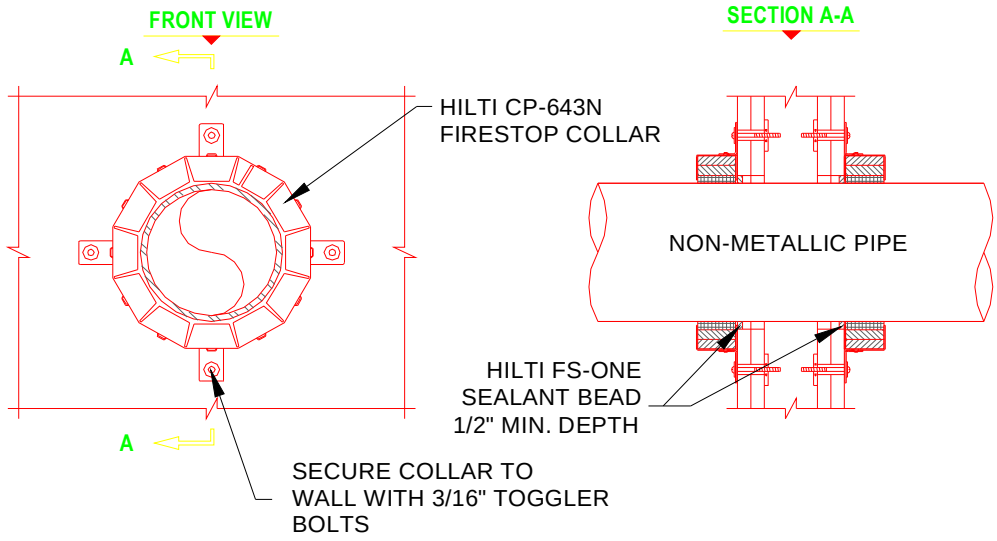
(A) LIGHTWEIGHT OR NORMAL WEIGHT CONCRETE FLOOR OR WALL (C-AJ-1226)



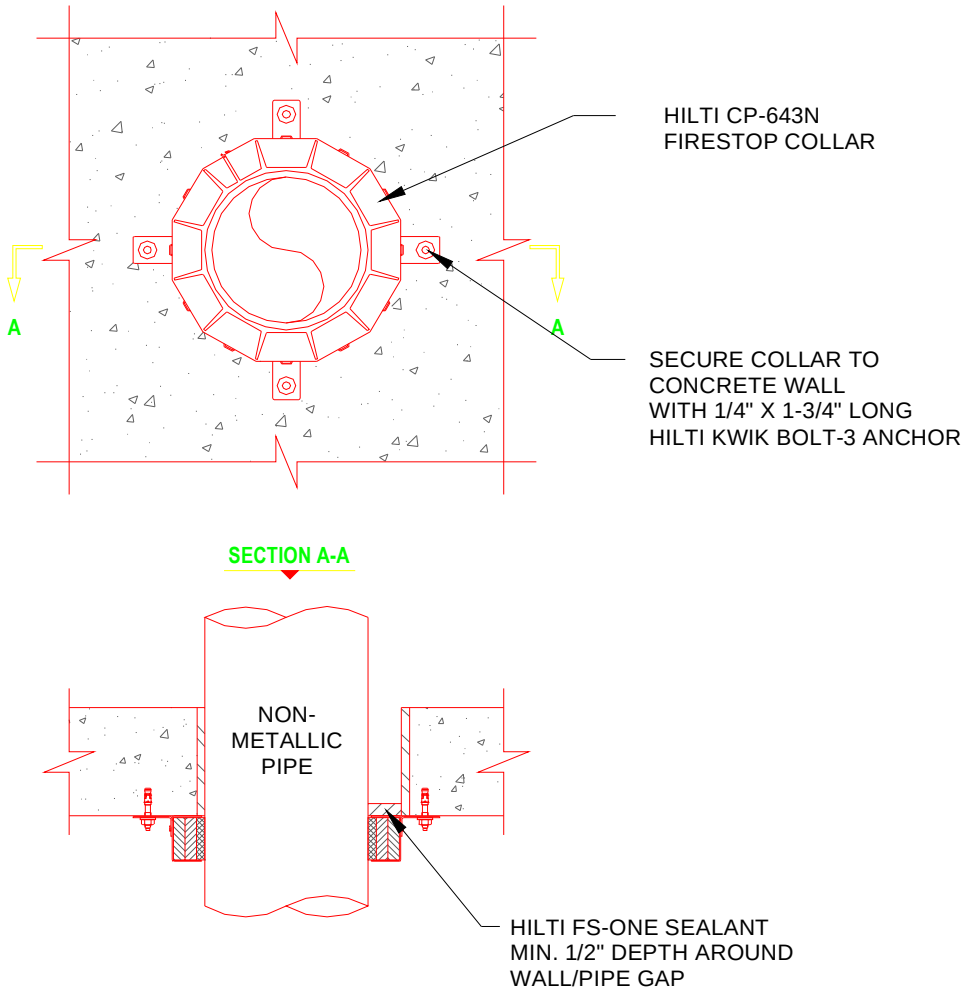
PENETRATING ITEM TO BE ONE OF THE FOLLOWING:
A. MAXIMUM 30" NOMINAL DIAMETER STEEL PIPE (SCHEDULE 10 OR HEAVIER)
B. MAXIMUM 30" NOMINAL DIAMETER CAST IRON PIPE
C. MAXIMUM 6" NOMINAL DIAMETER COPPER PIPE
D. MAXIMUM 6" NOMINAL DIAMETER STEEL CONDUIT
E. MAXIMUM 4" NOMINAL DIAMETER EMT

(B) GYPSUM WALL ASSEMBLY (1 HR. OR 2 HR. FIRE-RATING) (W-L-1054)

F-55 – BUILDING SERVICES NON-METALLIC PIPE THROUGH WALL/FLOOR

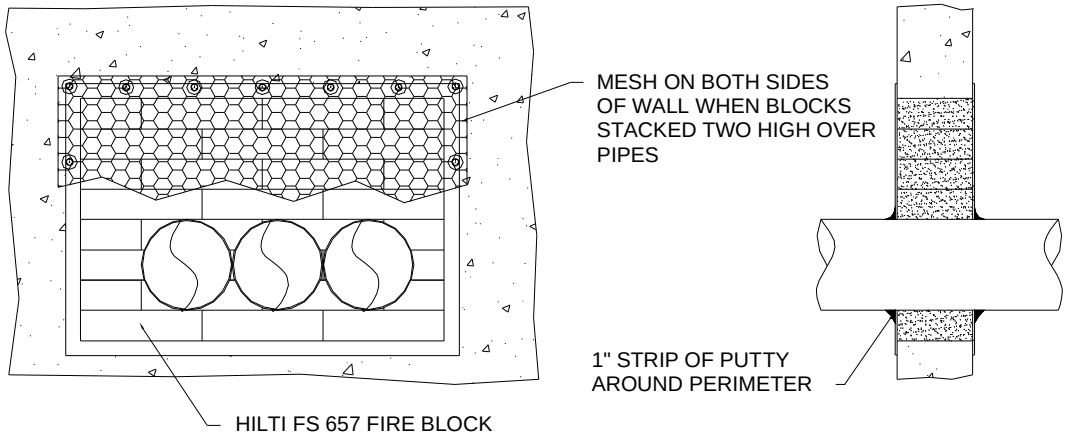


(A) NON-METALLIC PIPE THROUGH GYPSUM WALL ASSEMBLY (W-L-2078)



(B) NON-METALLIC PIPE THROUGH CONCRETE FLOOR/WALL (C-AJ-2109)

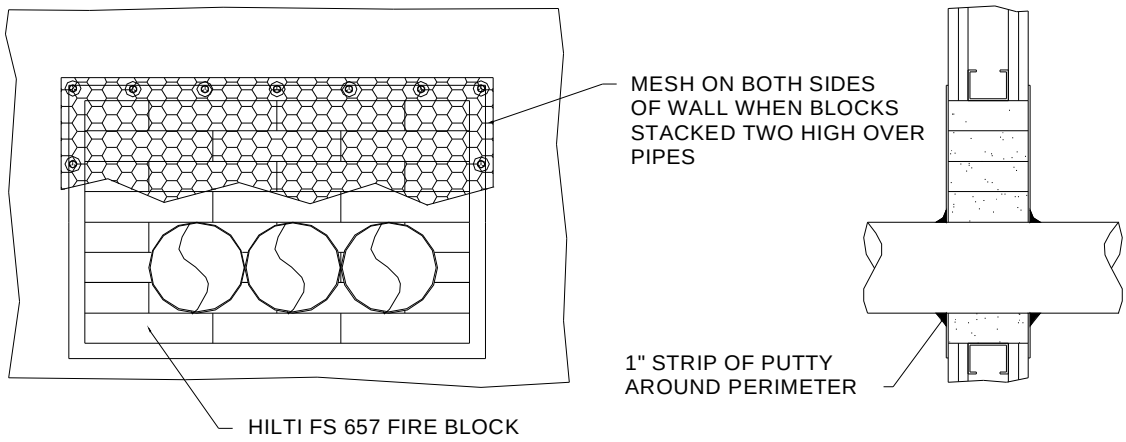
FIGURE F-56 BUILDING SERVICES MULTIPLE ITEMS THROUGH WALLS (W-L-8114E)



A. MAXIMUM 12" NOMINAL DIAMETER STEEL PIPE (SCHEDULE 10 OR HEAVIER)
B. MAXIMUM 12" NOMINAL DIAMETER CAST IRON PIPE
C. MAXIMUM 6" NOMINAL DIAMETER COPPER PIPE
D. MAXIMUM 6" NOMINAL DIAMETER STEEL CONDUIT
E. MAXIMUM 4" NOMINAL DIAMETER EMT
F. NOMINAL 1-1/2" THICK GLASS-FIBER PIPE INSULATION
G. NOMINAL 2" DIAMETER STEEL CONDUIT OR EMT (MAX. QUANTITY = 13)

Maximum area of opening = 2495 square inches, with maximum dimension of 52”.

(A) 2-HR. CONCRETE WALL OR BLOCK WALL (W-J-8016b)

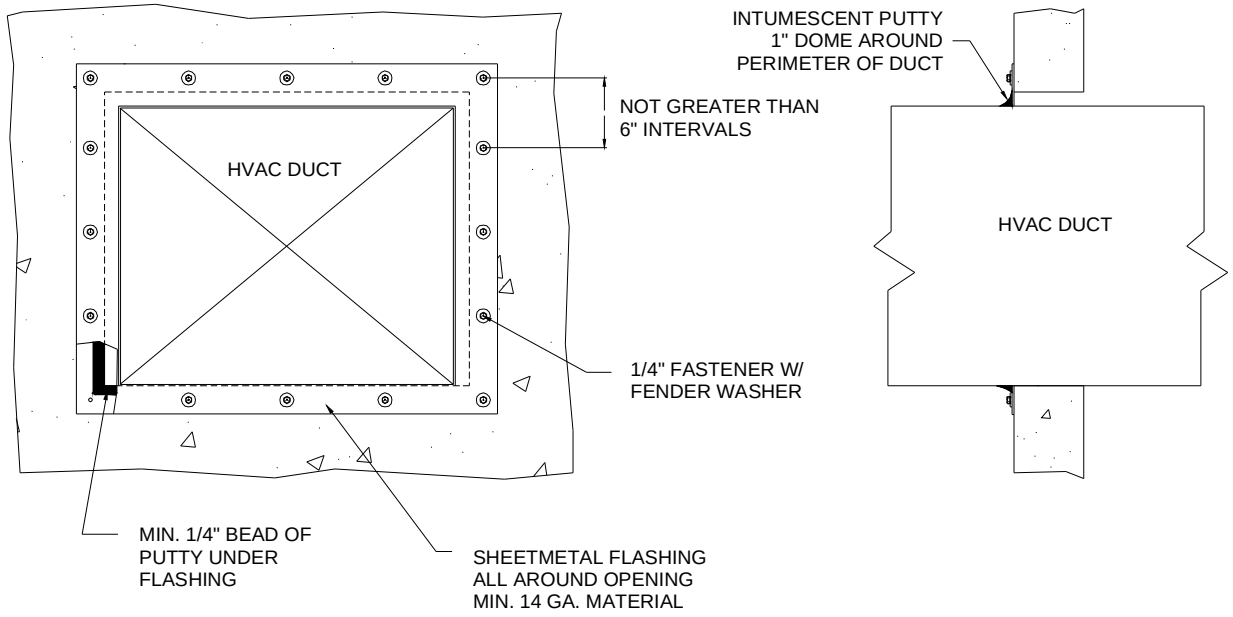


A. MAXIMUM 3" NOMINAL DIAMETER PVC PLASTIC PIPE (SCHEDULE 40, SOLID CORE)
B. MAXIMUM 6" NOMINAL DIAMETER STEEL PIPE (SCHEDULE 40 OR HEAVIER)
C. MAXIMUM 4" NOMINAL DIAMETER STEEL CONDUIT
D. MAXIMUM 4" NOMINAL DIAMETER EMT
E. MAXIMUM 4" NOMINAL DIAMETER COPPER PIPE
F. NOMINAL 1-1/2" GLASS-FIBER PIPE INSULATION MAY BE USED ON ANY OR ALL METALLIC PIPES.

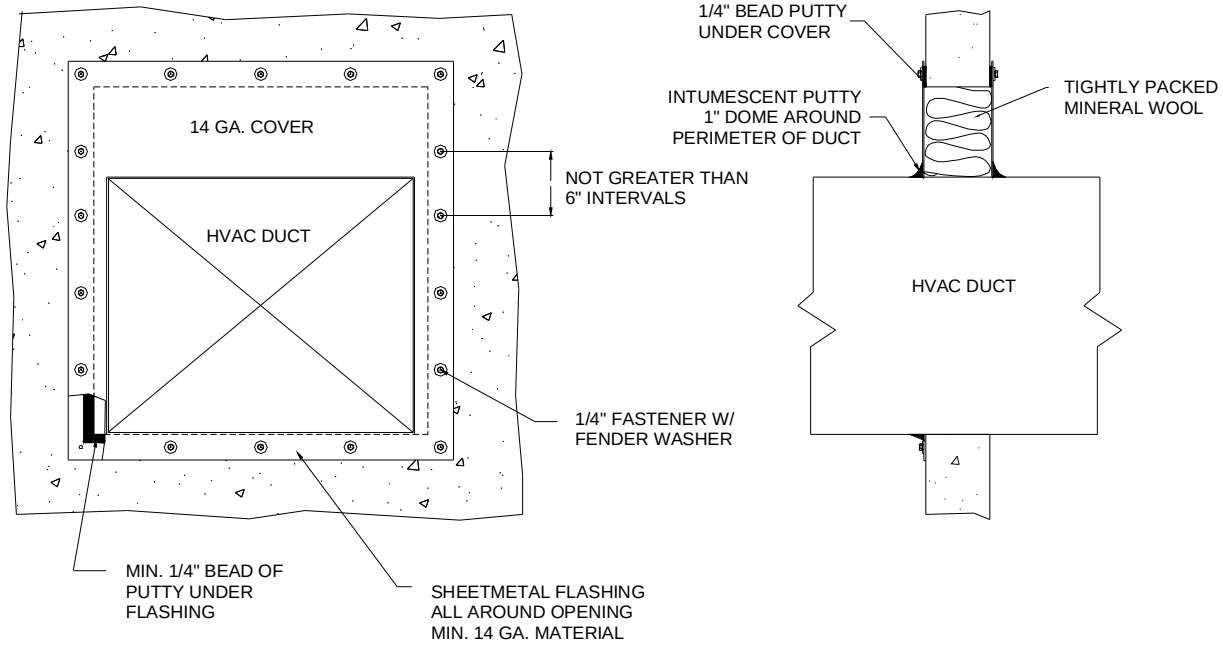
MAXIMUM SIZE OF OPENING = 22" X 16"

(B) 1-HR. OR 2-HR. GYPSUM WALL ASSEMBLY

FIGURE F-57 BUILDING SERVICES FIRE STOPPING HVAC DUCT



(A) WALL OPENING WITHIN 2 INCHES OF DUCT



(B) LARGER WALL OPENINGS AROUND DUCT

[END OF SECTION]

SECTION G – FLOOR DRILLING

CONTENTS PAGE

1. GENERAL

1.1. Introduction

1.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all equipment added, rearranged or modified is properly installed and in conformance with AT&T LEC installation specifications.

1.1.2 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

1.1.3 This section covers requirements for floor drilling and cutting/lifting procedures. These procedures shall be used to penetrate resilient vinyl floor coverings including floor tile or sheet/rolled goods (such as linoleum) that contain asbestos or are presumed to contain asbestos. Should a floor covering material suspected to contain asbestos other than the above be encountered (such as asphalt planking), it must be sampled and analyzed to establish content or otherwise presumed to be asbestos. Disturbance of materials other than floor tile or sheet/rolled goods (such as linoleum) containing asbestos or presumed to contain asbestos shall be conducted by a licensed asbestos professional.

1.1.4 Changes in this issue of Section G of ATT-TP-76300 are summarized in Table G-1.

1.1.5 These procedures shall be used when drilling in resilient vinyl floor coverings (i.e. floor tile and sheet/rolled goods such as linoleum) containing asbestos or presumed to contain asbestos and when cutting/lifting resilient vinyl floor coverings containing asbestos or presumed to contain asbestos.

1.1.6 The procedures shall also be used as a dust control practice when drilling in concrete and non-asbestos containing flooring.

1.1.7 The procedures described here apply to AT&T LECs in the following states: Arkansas, California, Connecticut, Indiana, Illinois, Kansas, Michigan, Missouri, Nevada, Ohio, Oklahoma, Texas, and Wisconsin.

1.1.8 The procedures described herein DO NOT apply to work within schools. Disturbance of materials containing asbestos or presumed to contain asbestos in schools shall be conducted by a licensed asbestos professional.

1.2. REQUIREMENTS

1.2.1 The Installation Supplier shall adhere to all federal, state and local regulations regarding hazardous material/waste in addition to AT&T LEC installation requirements.

1.2.2 The Installation Supplier shall coordinate with the AT&T LEC Representative before any activity related to hazardous material/waste is started.

1.2.3 Installation Suppliers shall follow the Negative Exposure Assessment (NEA) floor covering drilling procedures when drilling in floors and the Negative Exposure Assessment (NEA) cutting/lifting procedures when cutting/lifting floor coverings.

1.2.4 The Installation Supplier shall place written documentation in the yellow wallet noting positive verification of the absence of ACM when the Installation Supplier cuts/drills in non-asbestos containing floors.

1.2.5 In the event of any of the following occurrences, the Installation Supplier shall immediately contact the AT&T LEC representative who will contact the appropriate AT&T organization:

Type of Occurrence	AT&T LEC will contact…
Regulatory agency inspector visit to site	AT&T Corporate Safety (1-866-782-SAFE)
Accidental exposure to suspected asbestos	AT&T Corporate Safety (1-866-782-SAFE)
Accidental release of suspected asbestos to the environment, or encountering material that can not be drilled, cut or lifted by NEA methods.	**Environmental Management** 1-866-492-6836 or 1-866-I WANT EM

2.0 TRAINING

2.1 GENERAL

2.1.1 Installation Suppliers who perform these procedures on suspected/presumed/confirmed asbestos floor coverings shall be trained in the NEA floor drilling procedures or the NEA cutting/lifting procedures.

2.1.2 Unqualified Installation Suppliers shall not drill in or cut/lift suspected/presumed/confirmed asbestos containing floor coverings.

2.1.3 Training shall include, at a minimum:

a) Annual Asbestos Awareness training;

b) Annual floor covering drilling procedure training; and

c) Initial hands-on training of the NEA floor covering drilling procedure; and/or

d) Annual floor covering cutting/lifting procedure training; and

e) Initial hands-on training of the NEA floor covering cutting/lifting procedure.

2.1.4 The Installation Supplier shall obtain the training from an appropriate trainer.

Important Note Regarding Qualified Trainers

Effective January 1, 2002 Installation Supplier's Primary trainer(s) shall attend an annual refresher-training course administered by a Core training provider. Only Core Trainers and Primary Trainers shall conduct NEA drilling or cutting/lifting procedure training.

Core Trainers are trainers approved by AT&T to conduct Asbestos Awareness and NEA Floor Covering Drilling and Cutting/Lifting Procedures training. The list of Core trainers is available by contacting the NEA Management Center. Core trainers shall provide independent "Train the Trainer" courses valid for one year from the date the course is successfully completed.

Primary Trainers – Trainers who have attended the "Train the Trainer" course conducted by Core Trainers shall be considered "Primary Trainers." Primary trainers are qualified to train and certify persons **within their organization** who will perform drilling or cutting/lifting of floor coverings using the NEA procedures. Primary trainers are also qualified to perform drilling themselves. Primary Trainers shall be qualified to conduct training for a period of one year from the date of training by Core Trainers.

2.1.5 Training shall be valid for a period of one year from the completion of training.

2.1.6 Training shall be documented on a Training Attendance Form (FigureG-1) and submitted to:

AT&T NEA Management Center (Page G-12)

3. DRILLING HOLES IN FLOORS

3.1 GENERAL

3.1.1 The Installation Supplier shall use the NEA floor drilling procedure to drill in asbestos-containing or suspected asbestos-containing vinyl floor coverings.

3.1.2 The procedures shall also be used as a dust control practice when drilling in concrete and non-asbestos containing flooring

3.1.3 The Installation Supplier shall use the NEA floor drilling procedures only in the following states: Arkansas, California, Connecticut, Illinois, Indiana, Kansas, Michigan, Missouri, Nevada, Ohio, Oklahoma, Texas and Wisconsin.

3.1.4 Records of the asbestos content in flooring materials may be available for review. To access these records, the Installation Supplier shall call the following numbers to determine if the floor to be drilled contains asbestos, or is presumed to contain asbestos:

a)	AT&T West	AT&T LEC Representative
b)	AT&T East	888/387-7638
c)	AT&T Midwest	AT&T LEC Representative
d)	Missouri, Oklahoma, Kansas, Arkansas	314/235-4768
e)	Texas	214/464-2811

Unless verification is received from one of these sources that the floor covering is NOT asbestos-containing, the material shall be presumed to be asbestos-containing and treated as such.

3.1.5 Hole drilling in the state of Oklahoma shall be limited to vinyl floor tile only. This procedure shall not be used to drill other substances such as rolled or sheet floor coverings (e.g. linoleum) in these states. In Oklahoma the installation supplier shall contact the AT&T LEC Equipment Engineer to arrange for a licensed asbestos abatement contractor to drill the holes or remove the asbestos-containing materials and properly dispose of the debris if the material is not floor tile.

3.1.6 The Installation Supplier shall use manual stops on drills to control the depth of the hole when drilling anchor holes. Tape or other types of non-mechanical stops are not permitted (i.e., tape).

3.2 Floor Drilling Procedure

3.2.1 The following procedures shall be followed by the Installation Supplier for solid-bit floor drilling in asbestos containing vinyl floor coverings (drilling holes one-inch in diameter or less).

a) Complete the Negative Exposure Assessment (NEA) form (Figure G-3). The completed form shall be maintained on-site until all drilling activities have been completed. Page 2 of the completed form shall be sent or faxed to the NEA Management Center within two days of completion of the drilling activities.

b) Place the completed NEA form in the yellow wallet at the job site.

The immediate area shall be clear of all people who have not completed the Asbestos Floor Covering Drilling training course.

c) The following equipment and supplies are required for this procedure: Impact drill with masonry bit, shaving cream, wet paper towels, marking pen, plastic sealable bags.

d) Mark the location where the hole is to be drilled. You may tear a small hole in the center of the wet paper towel; place the hole over the marked location where the hole is to be drilled. Position the drill on the marked location bit on the location of the hole to be drilled and apply an ample amount of debris encapsulant (LEPEC, shaving cream or shaving gel), covering a minimum of two inches in diameter and one inch deep around the drill bit.

e) Drill at slow speed until a hole is drilled into the concrete substrate to the required depth.

f) Stop the drilling and retract the bit slowly without disturbing the debris, concrete and encapsulant around the hole. Wipe the drill bit with a wet paper towel and place into a sealable plastic bag. Fold the corners of the wet paper towel over the mound of shaving cream which is covering the drilled hole; pick up the towel containing the encapsulant and debris, place into the plastic bag.

g) Wipe the floor around the hole with a wet paper towel, holding it flat against the floor with the palm of the hand. Wipe once in an S-pattern and place towel into the plastic bag. The towel shall not be reused.

h) Wipe the floor again in an S-pattern, at right angles to the direction that you wiped the first time. Place the used towel into the plastic bag. The towel shall not be reused.

i) Continue wiping in alternating S-patterns until you cannot see or feel any dust or debris. The towels shall not be reused. Place all used towels into a sealable plastic bag and seal.

j) Place the sealed bag into another bag and seal it also.

k) Vacuum cleaners, of any type, shall NOT be used by the Installation Supplier to clean up asbestos containing or presumed asbestos containing material.

l) High Efficiency Particulate Air (HEPA) vacuum cleaners may be used to clean up non-asbestos concrete dust remaining in the holes after the procedure outlined above has been completed.

m) Dispose the bagged debris as follows:

1. In AT&T Southwest –

   i. Place the double-bagged debris into a padded envelope and seal it. Mark the outside of the padded envelope "CO Drilling."

   ii. Complete a MDR for drilling debris stating the disposition of material and place it in the yellow wallet.

   iii. Mail the padded envelope, via AT&T LEC **company mail** , to:

   331 Nolan St. Dock #7 San Antonio, TX

   Attach a copy of the MDR to the outside of the padded envelope, with each shipment.

2. AT&T Midwest –

   i. Place the double-bagged debris into a padded envelope and seal it. Mark the outside of the padded envelope "CO Drilling"

   ii. Complete a MDR for drilling debris stating the disposition of material and place it in the yellow wallet.

   iii. Mail the padded envelope, via AT&T LEC **company mail**, to:

   36 South Fairview, 4th Floor, Park Ridge, IL.

   Attach a copy of the MDR to the outside of the padded envelope, with each shipment.

3. AT&T East –

   i. Place the double-bagged debris into the trash.

   ii. Complete a MDR for drilling debris stating the disposition of material and place it in the yellow wallet.

   iii. Fax a completed MDR to 847/384-5999.

4. AT&T West

   i. Place the double-bagged debris into the trash.

   ii. Complete a MDR for drilling debris stating the disposition of material and place it in the yellow wallet.

   iii. Fax a completed MDR to 925-973-0584.

3.2.2 The following procedures shall be followed by the Installation Supplier for Drilling in Other Asbestos-Containing Material:

a) If it is unknown whether the floor covering material contains asbestos, it shall be presumed to contain asbestos.

b) If the Installation Supplier encounters an asbestos-containing floor covering other than resilient vinyl floor tile or a sheet/rolled product such as linoleum the Installation Supplier shall contact the AT&T LEC

Equipment Engineer to arrange for a licensed asbestos abatement contractor to drill the holes or remove the asbestos-containing materials and properly dispose of the debris.

c) The Installation Supplier shall complete the MDR to document the disposition of the debris. The MDR shall be managed as described in Section G of this document and a copy placed in the yellow wallet.

3.2.3 The following procedures shall be followed by the Installation Supplier for Drilling in Concrete and Non-Asbestos Containing Flooring

a) To facilitate dust control, the Installation Supplier shall drill bare concrete and non-asbestos containing flooring in the same manner as the asbestos floor covering material; i.e., by utilizing debris encapsulant.

b) The debris and the encapsulant, after being cleaned up with a wet cloth or paper towel, may be disposed of as ordinary trash.

c) High Efficiency Particulate Air (HEPA) vacuum cleaners shall be used to clean up concrete dust remaining in the holes.

d) A MDR shall be completed and placed in the yellow wallet to report the disposition of the non-asbestos containing residue.

e) Installation Suppliers who perform this process on non-asbestos floors only need not be trained in the Negative Exposure Assessment (NEA) floor covering drilling procedures.

4.0 CUTTING/LIFTING FLOOR COVERINGS

4.1 General

4.1.1 These procedures are to be used for lifting pieces of intact or substantially-intact asbestos containing floor coverings in preparation for core drilling through a concrete slab or otherwise drilling holes in excess of one-inch in diameter. Each operation consists of the removal of enough floor covering to core drill one hole.

4.1.2 The Installation Supplier shall not penetrate asbestos floor covering with a power coring tool. That would be considered mechanical chipping, which is prohibited by the OSHA asbestos regulations.

4.1.3 These procedures shall also be used as a dust control practice when cutting/lifting non-asbestos containing flooring

4.1.4 The Installation Supplier shall use the NEA cutting/lifting procedures only in the following states: Arkansas, California, Illinois, Indiana, Kansas, Michigan, Missouri, Nevada, Ohio, Oklahoma, Texas and Wisconsin.

4.1.5 Records of the asbestos content in flooring materials may be available for review. To access these records, the Installation Supplier shall call the following numbers to determine if the floor covering to be cut/lifted contains asbestos, or is presumed to contain asbestos:

a) AT&T West	AT&T LEC Representative
b) AT&T Midwest	AT&T LEC Representative
c) Missouri, Oklahoma, Kansas, Arkansas	314/235-4768
d) Texas	214/464-2811
e) Connecticut	888/387-7638

Unless verification is received from one of these sources that the floor covering is NOT asbestos-containing, the material shall be presumed to be asbestos-containing and treated as such.

4.1.6 Cutting/lifting in the State of Oklahoma shall be limited to vinyl floor tile only. This procedure shall NOT be used to cut/lift other substances such as rolled or sheet floor coverings (e.g. Linoleum) in Oklahoma. In Oklahoma the Installation Supplier shall contact the AT&T LEC Equipment Engineer to arrange for a licensed asbestos abatement contractor to or remove the asbestos-containing materials and properly dispose of the debris if the material is not floor tile.

Cutting/lifting in the State of Connecticut shall be performed by an AT&T approved abatement contractor.

4.1.7 The following equipment and supplies are required for these procedures:

Bottle with soapy water or shaving cream (see 4.1.8)
Waterproof marker pen
Chisels and hammer (see 4.1.9)
Heavy-bladed scraper
Silicone caulk
Wet paper towels
Sealable plastic freezer bags – one gallon size or larger

4.1.8 Use of chemical mastic removers is discouraged because of potential flammability and toxicity hazards. If the mastic cannot be removed with soapy water, use mastic remover in accordance with the Material Safety Data Sheet and manufacturer's instructions for the product. Soapy water will work better than shaving cream.

4.1.9 A chisel with a large (~2" wide) blade works best for cutting the covering and one with a smaller blade works best for lifting the covering and for removing the mastic. The chisels shall be kept as sharp as possible.

4.1.10 The Installation Supplier shall not use any type of vacuum cleaner to pick up debris. An ordinary shop vacuum will not capture microscopic asbestos fibers and OSHA regulations do not allow their use.

4.1.11 The following procedures describe the use of a chisel to cut through the covering. The choice of tool is left to the discretion for the installer and may depend on the covering being removed and where the hole is to be drilled relative to the edges of the covering. The procedures also differ slightly depending on the location of the hole, as defined below.

4.1.12 The installer shall endeavor to minimize breakage of the remaining flooring material surrounding the piece being removed.

4.2 Cutting/Lifting Procedures

4.2.1 These procedures do not describe the actual core drilling operation. If vibration from the core drilling causes pieces of floor covering to come loose,

a) Stop the core drilling temporarily and vacate all persons who have not been trained on using these procedures from the immediate area;
b) Pick up the loose pieces of material, wet them and put them in sealable plastic bags;
c) Clean the mastic from the exposed concrete as described in these procedures.

4.2.2 Complete the Negative Exposure Assessment (NEA) form (Figure G-2). The completed form shall be maintained on-site until all cutting/lifting activities have been completed. Page 2 of the completed form shall be sent or faxed to the NEA Management Center within two days of completion of the cutting/lifting activities. Place the completed NEA form in the yellow wallet at the job site.

The immediate area shall be clear of all person who have not completed the Asbestos Floor Covering Cutting/Lifting training course.

4.2.3 Waste material generated by these procedures shall be disposed of in accordance with instructions provided for the building you are working in.

4.2.4 Place the coring bit on the location where the hole through the slab will be drilled. With the marking pen, draw a square on the floor covering around the bit at least a half-inch larger than the diameter of the bit.

4.2.5 Apply a bead of shaving cream or amended (soapy) water over the lines.

4.2.6 Using a large chisel, cut through the floor covering through the shaving cream or amended water. It is not important to cut exactly on the lines.

4.2.7 Pry the piece of floor covering off the concrete with the heavy-bladed scraper, tapping the end of the scraper handle with the hammer. The piece may break – this is not a problem.

4.2.8 Wet the mastic on the back of the floor covering piece and put the piece of floor covering in a sealable plastic bag.

4.2.9 Wet the mastic on the concrete with shaving cream or amended water and scrape it off with the small chisel. An asphalt stain may remain on the surface, but there should be no reside – the surface should be smooth to the touch.

4.2.10 Wipe the concrete with wet paper towels until it is clean. Fold the towel over every time you use it. Put the towels in the sealable plastic bag.

4.2.11 Seal the exposed edges of covering with the caulk. Let it dry before core drilling the hole.

4.2.12 When the procedure is complete put the sealed bag into another bag and seal it also. Dispose the bagged debris as follows:

a) AT&T Southwest –

1. Place the double-bagged debris into a padded envelope and seal it. Mark the outside of the padded envelope “CO Drilling.”
2. Complete a MDR for drilling debris stating the disposition of the material and place it in the yellow wallet.
3. Mail the padded envelope, via AT&T LEC **company mail** , to:

331 Nolan St. Dock #7, San Antonio, TX.

Attach a copy of the MDR to the outside of the padded envelope, with each shipment.

b) AT&T Midwest –

1. Place the double-bagged debris into a padded envelope and seal it. Mark the outside of the padded envelope “CO Drilling.”

2. Complete a MDR for drilling debris stating the disposition of the material and place it in the yellow wallet.

3. Mail the padded envelope, via AT&T LEC **company mail**, to:

36 South Fairview, 4th Floor, Park Ridge, IL.

Attach a copy of the MDR to the outside of the padded envelope, with each shipment.

c) AT&T West

1. Place the double-bagged debris into the trash.

2. Complete a MDR for drilling debris stating the disposition of the material and place it in the yellow wallet.

3. Fax a completed MDR to 925/867-0241.

d) AT&T East-

1. Asbestos debris shall be disposed of in accordance with applicable regulations by AT&T approved abatement contractor.

2. Original signed documents for transport and disposal must be forwarded to:

AT&T-Environmental Management

308 S Akard-room 900

Attn-Waste Management

Dallas, TX 78202

5.0 DOCUMENTATION

5.1 General

The following forms shall be used to document the floor drilling procedures and cutting/lifting procedures described in this section:

a) Training Attendance Form (Figure G-1)

b) Negative Exposure Assessment Form **–** Cutting/lifting (Figure G-2)

c) Negative Exposure Assessment Form - Floor drilling (Figure G-3)

d) Negative Exposure Assessment Form –Notice of Non-Conformance Form (Figure G-4)

e) Material Disposition Record Form (Section E, Figure E-5)

5.2 NOTICE OF NON-CONFORMANCE

5.2.1 An Installation Supplier submitting invalid training or NEA documentation will receive a Notice of Non-Conformance (Figure G-4) which requires the Installation Supplier to correct the situation immediately.

5.2.2 Questions and requests for information may be forwarded to the NEA Management Center.

TABLE G-1 – SUMMARY OF CHANGES IN SECTION G

Change	Item in 11/1/05 Issue	Item in this issue
Revised	4.1.6 4.2.12 d)	4.1.6 4.2.12 d)
Deleted		
Added		

FIGURE G-1 – TRAINING ATTENDANCE FORM

A reproducible copy of the Training Attendance Form is provided on the following page.

Training Attendance Form

Asbestos Awareness and AT&T Floor Covering Procedure(s)

Date of Training: _____ Trainer Company :_____

Trainer:_____
(Please Print Clearly) Name ID Number Phone Number

THIS TRAINING INCLUDED Drilling ____ Cutting & Lifting (Coring) ___ Both_____

Persons Trained	ID Number or last 4 digits of Social Security Number	Company

I do hereby certify that each person listed above has received "Asbestos Awareness" training and completed the training program entitled "Asbestos Floor Covering Work Practices". During "hands-on" training with non-asbestos floor coverings and mastic, each person demonstrated the ability to drill holes through or cut and remove intact pieces of floor covering in accordance with established procedures; "Drilling Holes in Asbestos-Containing Floors" and/or "Lifting Pieces of Asbestos-Containing Floor Covering." In my judgment, these individuals are qualified to safely and correctly perform the procedure(s) as trained.

_____
Signature Date

Submit completed training form by mail or fax to:

NEA Management Center
10713 RR 620 North
Suite 621
Austin, Texas 78726

Ph: 512-250-2600
Fax: 512-250-2940

FIGURE G-2 – NEGATIVE EXPOSURE ASSESSMENT FORM
LIFTING PIECES OF ASBESTOS CONTAINING FLOOR COVERING
FOR HOLES LARGER THAN 1-INCH IN DIAMETER

A reproducible copy of the Negative Exposure Assessment Form is provided on the following page.

NEGATIVE EXPOSURE ASSESSMENT
for
DRILLING HOLES IN ASBESTOS-CONTAINING FLOORS
Holes up to 1-inch in diameter

For use in AT&T buildings in authorized States only
For use only by authorized contractors and AT&T employees
This form may not be altered except as authorized by AT&T

REVISED July 24, 2006 **VALID UNTIL July 24, 2007**

A. Description of current job

1. The procedure used for installation of equipment on asbestos-containing resilient floor coverings includes drilling holes in the coverings, using shaving cream to control debris and fiber release. This NEA is applicable to both vinyl floor tile and sheet vinyl/rolled goods such as linoleum with asbestos backing material.

2. Type and amount of material - Work will be performed on 9" x 9" and/or 12" x 12" resilient floor tile and/or sheet/rolled vinyl floor covering such as linoleum , installed on a concrete floor, and on the associated adhesive mastic.

3. Type and percent asbestos - The floor covering is presumed to contain asbestos and no samples have been taken for analysis.

4. Engineering controls - No engineering controls are required.

5. Worker's training and experience - Workers have completed a 2-hour Awareness Training course, plus training in use of the drilling procedure. This training included "hands-on" exercises using non-asbestos floor coverings similar to the asbestos-containing material on which the work will be performed.

6. Class of work - Class III work - Maintenance and repair on resilient floor covering.

B. Initial Exposure Assessment (IEA) - Resilient Floor Tile Drilling

1. Initial Exposure Assessment (IEA) was completed on October 23, 1996
   a. *Name of person performing IEA*: Andrew F. Oberta, MPH, CIH, The Environmental Consultancy, Austin, TX, a licensed asbestos consultant (TDH License No. 10-5430).
   b. *Was a project design completed for this project?* Yes. Test procedures and air sampling procedures were prepared, and a drawing of the test facility was provided.
   c. *Were engineering controls implemented as designed?* Yes.
   d. *Results of an 8-hr TWA:* No 8-hr TWA exposures were calculated. The sample results in Table 1a are for the actual duration of sampling, which ranged from 20 to 230 minutes (average = 62). 8-hr TWA exposures would be less than the values in Table 1, all of which are below the PEL of 0.1 fibers/cc.
   e. *Results of a 30-minute STEL:* All of the EL samples are below the excursion limit of 1.0 fibers/cc.
   f. *How were these samples analyzed?* Phase Contrast Microscopy using NIOSH Method 7400.
   g. *Are the results less than the PEL and the EL?* Yes. Also, the 95% UCL is below the PEL and EL.
   h. *Were the samples taken representative of all operations which will take place during the work?* Yes, provided that the workers receive training in using the procedure, that they use similar equipment and materials, and that work is limited to resilient floor tile.

Table 1a. Summary of Personal Samples for hole drilling on floor tile
Collected October 10, 17 and 23, 1996

	PEL samples	EL samples
No. of tests	3	3
No. of samples	8	16
Range, fibers/cc	0.0053 – 0.0114	0.0237 - 0.098
Average, fibers/cc	0.008	0.033
95% UCL, fibers/cc	0.012	0.062

Drilling NEA Form - ***Holes up to 1-inch in diameter***
Page 2 of 3 **Make sure you have the correct form !!!!!**
Form Expires July 24, 2007

2. Annual Updates have been conducted for drilling holes in floor tile. The most recent is summarized below.
   a. *Name of person performing update*: Peter D. Cappel, Gobbell Hays Partners, Inc.
   b. *Was a project design completed for this project?* A test plan and air sampling strategy were prepared.
   c. *Were engineering controls implemented as designed?* No engineering controls were necessary, based on the Initial Exposure Assessment and previous updates.
   d. *Results of an 8-hr TWA:* No 8-hr TWA exposures were calculated. The sample result below is for the actual duration of sampling, 90 minutes. 8-hr TWA exposures would be less than this value.
   e. *Results of the EL:* All of the EL sample results are less than the excursion limit of 1.0 f/cc.
   f. *How were these samples analyzed?* Phase Contrast Microscopy using NIOSH Method 7400.
   g. *Are the results less than the PEL and the EL?* Yes. Also, the 95% UCL is less than the PEL and EL.
   h. *Were the samples taken representative of all operations which will take place during the work?* Yes, provided that the workers receive training in using the procedure, that they use similar equipment and materials, and that work is limited to resilient floor tile.

See Table 2a below.

C. Initial Exposure Assessment (IEA) - Resilient Sheet Vinyl Flooring Drilling (Linoleum)

1. Initial Exposure Assessment (IEA) was completed on September 11 and 12, 2003
   a. *Name of person performing IEA*: Peter D. Cappel, Senior Industrial Hygienist, Gobbell Hays Partners, Inc.
   b. *Was a project design completed for this project?* Yes. Test procedures and air sampling procedures were prepared.
   c. *Were engineering controls implemented as designed?* Yes.
   d. *Results of an 8-hr TWA:* See Table 1b. All air samples collected were below the OSHA Permissible Exposure Limit of 0.1 fibers/cc.
   e. *Results of a 30-minute EL:* See Table 1b. All EL air samples collected were below the OSHA Excursion Limit of 1.0 fibers/cc.
   f. *How were these samples analyzed?* Phase Contrast Microscopy
   g. *Are the results less than the PEL and the EL?* Yes. In addition, the 95% UCL is below the PEL and EL.
   h. *Were the samples taken representative of all operations which will take place during the work?* Yes, provided that the workers receive training in using the procedure, that they use similar equipment and materials, and that work is limited to resilient sheet vinyl flooring.

Table 1b. Summary of Personal Samples for hole drilling on sheet vinyl flooring
Collected September 11 and 12, 2003

	PEL samples	EL samples
No. of samples	3	9
Range, fibers/cc	<0.016	<0.044
Average, fibers/cc	<0.017	<0.047
95% UCL, fibers/cc	0.023	0.099

2. Annual Updates have been conducted for drilling holes in sheet vinyl flooring. The most recent is summarized below.
   a. *Name of person performing update*: Peter D. Cappel, Gobbell Hays Partners, Inc.
   b. *Was a project design completed for this project?* A test plan and air sampling strategy were prepared.
   c. *Were engineering controls implemented as designed?* No engineering controls were necessary, based on the Initial Exposure Assessment.
   d. *Results of an 8-hr TWA:* No 8-hr TWA exposures were calculated. The sample result below is for the actual duration of sampling, 90 minutes. 8-hr TWA exposures would be less than this value.
   e. *Results of the EL:* All of the EL sample results are less than the excursion limit of 1.0 f/cc.
   f. *How were these samples analyzed?* Phase Contrast Microscopy using NIOSH Method 7400.
   g. *Are the results less than the PEL and the EL?* Yes. Also, the 95% UCL is less than the PEL and EL.
   h. *Were the samples taken representative of all operations which will take place during the work?* Yes, provided that the workers receive training in using the procedure, that they use similar equipment and materials, and that work is limited to resilient sheet vinyl flooring.

See Table 2b below.

DRILLING NEA Form - ***Holes up to 1-inch in diameter***
Page 3 of 3 **Make sure you have the correct form !!!!!**
Form Expires July 24, 2007

Table 2a. Summary of Personal Samples for hole drilling on floor tile
Collected July 24, 2006*

	PEL samples	EL samples
No. of samples	1	3
Range, fibers/cc	<0.013	<0.039-<0.039
Average, fibers/cc	<0.013	<0.039
95% UCL, fibers/cc	0.034	0.090

Table 2b. Summary of Personal Samples for hole drilling on sheet vinyl flooring
Collected July 24, 2006*

	PEL samples	EL samples
No. of samples	1	3
Range, fibers/cc	0.048	<0.039-0.089
Average, fibers/cc	0.048	0.070
95% UCL, fibers/cc	0.069	0.101

*Employer is responsible for obtaining current (within 12 months) air sampling data

This project was completed on (check one): ☐ **Floor Tile** ☐ **Sheet Vinyl Flooring**

Project/Job Information **Con./Project/TEO/Job #** _____

1. Description of work: Floor covering drilling Date(s) Work Performed: _____

This work will be performed at _____
CLLI City State

by employees of _____
Company that you work for

D. Certification of Negative Exposure Assessment

Based on the information herein, worker exposures during the current job described above are not expected to exceed the Permissible Exposure Limits, based on comparison of the current job to the Initial Exposure Assessment and annual updates described in Section B.

Name: _____ Signature: _____ Date: _____
PRINT name of competent person

Last 4 digits of SS# _____ Phone Number: _____

Installer _____ [PRINT name] ID (Last 4 digits of SS#) _____

Installer _____ [PRINT name] ID (Last 4 digits of SS#) _____

Return Last Page of Completed NEA Form to:

Fax: 512-250-2940

NEA Management Center
c/o TITAN Engineering
10713 RR 620 North, Suite 621
Austin, TX 78726
Phone: 512-250-2600

Return This Page Only! DO NOT SEND DEBRIS TO THIS ADDRESS

FIGURE G-3 – NEGATIVE EXPOSURE ASSESSMENT FORM

DRILLING HOLES IN ASBESTOS CONTAINING FLOOR COVERINGS

HOLES UP TO 1 INCH IN DIAMETER

A reproducible copy of the Negative Exposure Assessment Form is provided on the following page.

Drilling NEA Form - ***Holes up to 1-inch in diameter***
Page 2 of 3 **Make sure you have the correct form !!!!!**
Form Expires July 24, 2007

2. Annual Updates have been conducted for drilling holes in floor tile. The most recent is summarized below.
   a. *Name of person performing update*: Peter D. Cappel, Gobbell Hays Partners, Inc.
   b. *Was a project design completed for this project?* A test plan and air sampling strategy were prepared.
   c. *Were engineering controls implemented as designed?* No engineering controls were necessary, based on the Initial Exposure Assessment and previous updates.
   d. *Results of an 8-hr TWA:* No 8-hr TWA exposures were calculated. The sample result below is for the actual duration of sampling, 90 minutes. 8-hr TWA exposures would be less than this value.
   e. *Results of the EL:* All of the EL sample results are less than the excursion limit of 1.0 f/cc.
   f. *How were these samples analyzed?* Phase Contrast Microscopy using NIOSH Method 7400.
   g. *Are the results less than the PEL and the EL?* Yes. Also, the 95% UCL is less than the PEL and EL.
   h. *Were the samples taken representative of all operations which will take place during the work?* Yes, provided that the workers receive training in using the procedure, that they use similar equipment and materials, and that work is limited to resilient floor tile.

   See Table 2a below.

C. Initial Exposure Assessment (IEA) - Resilient Sheet Vinyl Flooring Drilling (Linoleum)

1. Initial Exposure Assessment (IEA) was completed on September 11 and 12, 2003
   a. *Name of person performing IEA*: Peter D. Cappel, Senior Industrial Hygienist, Gobbell Hays Partners, Inc.
   b. *Was a project design completed for this project?* Yes. Test procedures and air sampling procedures were prepared.
   c. *Were engineering controls implemented as designed?* Yes.
   d. *Results of an 8-hr TWA*: See Table 1b. All air samples collected were below the OSHA Permissible Exposure Limit of 0.1 fibers/cc.
   e. *Results of a 30-minute EL:* See Table 1b. All EL air samples collected were below the OSHA Excursion Limit of 1.0 fibers/cc.
   f. *How were these samples analyzed?* Phase Contrast Microscopy
   g. *Are the results less than the PEL and the EL?* Yes. In addition, the 95% UCL is below the PEL and EL.
   h. *Were the samples taken representative of all operations which will take place during the work?* Yes, provided that the workers receive training in using the procedure, that they use similar equipment and materials, and that work is limited to resilient sheet vinyl flooring.

Table 1b. Summary of Personal Samples for hole drilling on sheet vinyl flooring
Collected September 11 and 12, 2003

	PEL samples	EL samples
No. of samples	3	9
Range, fibers/cc	<0.016	<0.044
Average, fibers/cc	<0.017	<0.047
95% UCL, fibers/cc	0.023	0.099

2. Annual Updates have been conducted for drilling holes in sheet vinyl flooring. The most recent is summarized below.
   a. *Name of person performing update*: Peter D. Cappel, Gobbell Hays Partners, Inc.
   b. *Was a project design completed for this project?* A test plan and air sampling strategy were prepared.
   c. *Were engineering controls implemented as designed?* No engineering controls were necessary, based on the Initial Exposure Assessment.
   d. *Results of an 8-hr TWA:* No 8-hr TWA exposures were calculated. The sample result below is for the actual duration of sampling, 90 minutes. 8-hr TWA exposures would be less than this value.
   e. *Results of the EL:* All of the EL sample results are less than the excursion limit of 1.0 f/cc.
   f. *How were these samples analyzed?* Phase Contrast Microscopy using NIOSH Method 7400.
   g. *Are the results less than the PEL and the EL?* Yes. Also, the 95% UCL is less than the PEL and EL.
   h. *Were the samples taken representative of all operations which will take place during the work?* Yes, provided that the workers receive training in using the procedure, that they use similar equipment and materials, and that work is limited to resilient sheet vinyl flooring.

   See Table 2b below.

DRILLING NEA Form - ***Holes up to 1-inch in diameter***
Page 3 of 3 **Make sure you have the correct form !!!!!**
Form Expires July 24, 2007

Table 2a. Summary of Personal Samples for hole drilling on floor tile
Collected July 24, 2006*

	PEL samples	EL samples
No. of samples	1	3
Range, fibers/cc	<0.013	<0.039-<0.039
Average, fibers/cc	<0.013	<0.039
95% UCL, fibers/cc	0.034	0.090

Table 2b. Summary of Personal Samples for hole drilling on sheet vinyl flooring
Collected July 24, 2006*

	PEL samples	EL samples
No. of samples	1	3
Range, fibers/cc	0.048	<0.039-0.089
Average, fibers/cc	0.048	0.070
95% UCL, fibers/cc	0.069	0.101

*Employer is responsible for obtaining current (within 12 months) air sampling data

This project was completed on (check one): ☐ **Floor Tile** ☐ **Sheet Vinyl Flooring**

Project/Job Information **Con./Project/TEO/Job #** _____

1. Description of work: Floor covering drilling Date(s) Work Performed: _____

This work will be performed at _____
CLLI City State

by employees of _____
Company that you work for

D. Certification of Negative Exposure Assessment

Based on the information herein, worker exposures during the current job described above are not expected to exceed the Permissible Exposure Limits, based on comparison of the current job to the Initial Exposure Assessment and annual updates described in Section B.

Name: _____ Signature: _____ Date: _____
PRINT name of competent person

Last 4 digits of SS# _____ Phone Number: _____

Installer _____ [PRINT name] ID (Last 4 digits of SS#) _____

Installer _____ [PRINT name] ID (Last 4 digits of SS#) _____

Return Last Page of Completed NEA Form to:

Fax: 512-250-2940

NEA Management Center
c/o TITAN Engineering
10713 RR 620 North, Suite 621
Austin, TX 78726
Phone: 512-250-2600

Return This Page Only! DO NOT SEND DEBRIS TO THIS ADDRESS

FIGURE G-4 –NOTICE OF NON-CONFORMANCE

A copy of the Notice of Non-Conformance is provided on the following page.

NOTICE OF NON-CONFORMANCE

Attention: Date:

Contractor:

Regarding AT&T Project or Training :

Project Number: Project Date:

Project Location/Address:

This company has submitted information regarding an Asbestos Floor Covering Work Procedure and Negative Exposure Assessment (NEA), which is not in conformance with applicable regulations and/or AT&T installation requirements (TP76300MP). The following defects will be reported to AT&T unless corrected and reported to the NEA Management Center within five (5) working days. Note: Performance of the procedure by individuals not properly trained is not correctable after the fact.

The following incident of non-conformance was recorded:

The project is recorded on an expired NEA form. A current form is attached. Please complete and return. (Defect Code G4.1B – Failure to use NEA Form)

The project identification number is not recorded on the NEA form. Please provide. (Defect Code G4.1B – Failure to use NEA Form)

Training of persons listed on the NEA has expired. Please attend a refresher administered by a qualified trainer and notify NEA Management Center. (Defect Code G4.1A – Failure to use Training Attendance Form)

Persons listed on the NEA do not appear in the database of trained individuals or training has been expired for over one year. Please attend training administered by qualified trainer and notify the NEA Management Center or provide documentation of training. (Defect Code V3.2.1 – Handled Hazardous Materials Without Specialized Training)

The NEA form does not include the competent person, signature and/or date. (Defect Code G4.1B – Failure to use NEA Form)

The NEA form does not include identification numbers. (Defect Code G4.1B – Failure to use NEA Form)

Information on the NEA form is illegible. Illegible information (Defect Code G4.1B – Failure to use NEA Form)

Other:

Please correct this situation immediately. Questions and updated information may be forwarded to:

NEA Management Center
10713 RR 620 North
Suite 621
Austin, Texas 78726

Ph: 512-250-2600
Fax 512-250-2940

[END OF SECTION]

SECTION H -- GROUNDING AND BONDING

CONTENTS PAGE

1. GENERAL

1.1. Introduction

1.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all equipment added, rearranged or modified is properly installed and in conformance with AT&T LEC installation specifications.

1.1.2 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

1.1.3 This section covers the Grounding and Bonding requirements for Installation Suppliers performing services for the AT&T LEC.

1.1.4 Changes in this issue of Section H are summarized in Table H-1.

1.1.5 This section contains workmanship requirements. It is based on the engineering, installation and material requirements for grounding and bonding contained in the following documents:

a) ATT-TP-76416, Grounding and Bonding Requirements - for Network Facilities

b) ATT-C-98022-71, SNET Building Ground System; ATT-W-98023-31, Building Ground & Equipment Ground System.

1.1.6 Additional information on Grounding and Bonding (e.g. cabling, connectors, labeling, etc.) can be found in other sections of this document.

1.2. Definitions

1.2.1 The following terms are used throughout this section. Note: Where different terms are used for the same object, the AT&T LEC(s) to which these terms apply are listed in brackets after the term.

Bonding - The permanent joining of metallic sub-sections to form an electrically conductive path that will assure electrical continuity and the capacity to conduct safely any current likely to be imposed.

Common Bonding Network (CBN) - A set of interconnected objects that has one or more connections to a ground reference. This network, created by a multitude of connections, helps to ensure that the objects are at essentially the same potential when fault current flows through them. Building steel, water pipes, vertical and horizontal equalizer conductors, metallic raceways, raised floor systems, equipment frames and other conductive objects form a common bonding network when bonded together by intentional and incidental connections. This term is now used throughout this Section in place of “integrated ground plane”.

Central Office Ground Bar (CO GRD bar) - [AT&T Midwest, West, Southwest A bus bar that references the primary grounding system bus bar through the Vertical Riser. At least one of these bus bars is provided on each floor to permit the grounding of frames and power supplies, as required. See **Floor Ground Bar**.

DC Equipment Grounding Conductor (DCEG) - The conductor that bonds equipment frame, cabinet or other enclosure to the CO GRD system. The DCEG conductor may also bond an equipment unit within a frame, cabinet or other enclosure to the CO GRD system.

DC System Grounding Conductor - The conductor used to connect one side of a dc power source to the site's grounding system. Example: In a -48 volt battery-type power plant serving central office equipment, the conductor between the positive (+) side of the plant and a point on the office grounding system.

Equipment Ground - Deliberately engineered conductors in communication systems and AC and DC power distribution systems to provide electrical paths of sufficient capacity to permit protective devices (e.g. fuses, circuit breakers) to operate effectively and to equalize potential between equipment.

Floor Ground Bar (FGB) - [AT&T East] See **Central Office Ground Bar**.

Foreign Object - Any electrically conductive surface that is part of the Common Bonding Network and is within 7 feet of a conductive surface that is part of the Isolated Bonding Network.

Framework Ground - This term replaced by DC Equipment Grounding Conductor.

Grounded Conductor - A system or circuit conductor that is intentionally grounded. Example: The conductor usually referred to, as the grounded conductor is the neutral conductor in ac circuits and the battery return conductor in dc circuits.

Grounding Conductor - A conductor used to connect equipment or the grounded circuit of a wiring system to a grounding electrode or electrodes. Examples: The alternating current equipment ground (ACEG), also called the green wire, used to provide a fault current return path in ac power systems. The grounding conductors used to interconnect frames in transport equipment.

Ground Window - An imaginary, spherical area having a radius of 3 feet. This transition area contains, or is a portion of a bus bar that is the physical interface between the building's common bonding network and isolated bonding network equipment.

Ground Window Bar (GWB) - [AT&T East] See **Main Ground Bus**.

Horizontal Equalizers – 1) Conductors of relatively low impedance that interconnect vertical risers in a building that is of a size that requires more than one vertical riser; 2) The grounding wire that extends from the ground reference (COG/OPGP) to equipment areas on the same floor.

Integrated Ground Plane (See **Common Bonding Network**)

Isolated Bonding Network (IBN) - A set of interconnected objects that are referenced to ground at a single point. This network is insulated from contact with any other conductive member not part of the same bonding network. With only one point of ground reference, the possibility that the equipment will be used as a conductive path for transient currents from exterior sources is greatly reduced. This term is now used throughout this Section in place of “isolated ground plane”.

Isolated Ground Plane - (See **Isolated Bonding Network**)

Listed - Equipment or materials included in a list published by an organization acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of listed equipment or materials, and whose listing states either that the equipment or material meets appropriate designated standards or has been tested and found suitable for use in a specified manner.

Main Ground Bus (MGB) - [AT&T Midwest, West, Southwest] A bus bar located within the ground window that provides a physical means of connection between the CO GRD system and the isolated bonding network served by the ground window.

Office Principal Ground Point (OPGP) - A bus bar normally located near the AC entrance switchgear. It functions as:

a) the connection point for all main grounding conductors and earth electrodes

b) the point of origin for the Vertical Riser

c) When convenient, the COG for the floor where it is located.

Raceway - An enclosed channel designed expressly for holding wires, cables, or bus bars, with additional functions as permitted in the National Electrical Code (NEC).

Single Point Ground - A method used to ground a circuit at only one physical point.

Solidly Grounded - A method of grounding either a power supply or a frame that uses a grounding conductor connection in which no additional impedance has been intentionally connected in series with the grounding path.

Vertical Riser (VR) - This conductor, also called the vertical equalizer, extends ground reference from the office's primary ground bus to one or more other bus bars in the office. Note: The portion of this conductor that is routed horizontally between the office's primary ground bus and the first connection to another bus bars in the office is also called the vertical riser.

2. GROUNDING SYSTEM CONDUCTORS AND CONNECTIONS

2.1. General Requirements

2.1.1 All equipment shall be bonded to the appropriate grounding network before any other conductors are connected.

2.1.2 The Main Ground Bus (MGB) shall be within 1 floor of the isolated ground plane frames it serves.

2.1.3 All Common Bonding Network (CBN) grounding conductors shall be connected to the CBN side of the MGB. All Isolated Bonding Network (IBN) grounding conductors shall be connected to the IBN side of the MGB. See Figure H-5

2.1.4 Except for hatch plate bonding conductors, vertical risers and horizontal equalizers described in this section, the direction of a grounding conductor's bend (e.g. towards a specific bus bar, etc.) is not restricted. The direction of the bend shall be made for ease of installation and to maintain an acceptable bending radius.

2.1.5 Grounding conductors larger than #1/0 AWG shall be spliced or joined with compression-type H-tap.

2.1.6 Compression-type butt splice (i.e., 180 degree) connectors shall not be used.

2.1.7 The free ends of insulated conductors shall be covered with heat shrink end caps.

2.1.8 H-tap compression connectors on grounding conductors shall be protected using fire-retardant hard-shell or soft-shell covers.

2.1.9 All newly installed grounding conductors covered by this TP and that require insulation shall conform to the insulation colors shown in Table H-2. These color standards were first described in AT&T-NOTICE-000-000-415, dated March 20, 2002. Conversion of existing insulation colors purely for the sake of uniformity is not warranted.

Table H-2

REGION	NON-RAISED FLOORS	RAISED FLOORS
AT&T Midwest	Green	Green
AT&T West	Green	Green
AT&T East	Black	Black
AT&T Southwest	Gray	Green

2.2. Horizontal and Vertical Equalizers

2.2.1 All vertical and horizontal equalizer conductors shall be routed so that U shaped configurations are avoided.

2.2.2 Vertical and horizontal equalizers shall be run exposed so as to afford visual inspection of the entire system and to provide access for adding connectors.

2.2.3 Cable supports and sleeves provided for routing of horizontal and vertical equalizer conductors shall not be used for routing of any type of cable or conductor other than grounding conductors. Note: Horizontal equalizer conductors may be placed on the same cable brackets used to support other cables if secured to the opposite surface of the brackets.

2.2.4 Horizontal runs shall be supported along the exterior of cable rack stringers or from framing bars by means of clips or similar devices that do not form a closed metallic ring around the conductor. Short runs through walls shall be supported within 2" PVC plastic or other approved non-metallic conduit.

2.2.5 Vertical risers shall be run through floors in core-drilled holes or in 2" PVC plastic or other non-metallic conduit. If a cable hole is adjacent to the column supporting the vertical riser, the cable hole may be used in place of non-metallic conduit as long as a separation is maintained between the vertical riser and other conductors routed through the cable hole.

2.2.6 Vertical risers shall be secured to columns and walls using supports located within 2 feet of the floor, the ceiling, each side of any intervening bus bar, and at an interval of 2 feet (or less) between these points.

2.2.7 The vertical conductor may be supported by cable brackets or similar details fastened to Unistrut or other material that is anchored to a wall or column. An auxiliary support shall be provided on every other floor consisting of either wedge plugs in the top of sleeves or cable support grips suspended from J-bolts secured by anchors in the ceiling.

2.2.8 All cable connections to the vertical riser and horizontal equalizer shall be made with bends towards the COG/OPGP.

3. AC EQUIPMENT GROUNDING

3.1. Feeder and Branch Circuit Equipment Grounding System

3.1.1 For enclosures that require terminations of an Alternating Current Equipment Grounding (ACEG) conductor, the conductor shall be connected to the enclosure by one of the means listed below:

a) a ground bus bar

b) a terminal strip

c) a grounding bushing

d) a grounding clip

e) a screw fastener

f) the enclosure is surface mounted and direct metal-to-metal contact exists between it and the receptacle's mounting yoke

g) the receptacle is cover-mounted and the enclosure and cover combination are listed as providing satisfactory ground continuity between the enclosure and the receptacle

Note 1: Grounding clips are normally used only at junction boxes and receptacle enclosures.

Note 2: A screw fastener (machine screw, nut, bolt, stud, etc.) shall be used for no other purpose than to terminate ACEG conductors.

3.1.2 For enclosures that do not require terminations (pull boxes, T's, etc.) and when ground continuity is maintained via the conduit and bonding type bushings and lock nuts, termination of the ACEG conductor shall not be required.

3.2. Extending ACEG Conductors

3.2.1 Since AC distribution systems are of different ages, it is likely that a system not originally equipped with a separate ACEG conductor will be encountered. It is often not feasible to place an ACEG conductor in the existing upstream feeder conduit or raceway. However, the conduit or raceway may be able to serve as the ACEG conductor. The point from which an ACEG conductor is extended will usually be an enclosure such as a:

a) Distribution panel

b) Pull box

c) Junction box

d) Receptacle box

e) Lighting fixture.

3.2.2 Before any ac distribution system is extended or rearranged from a point in a distribution system not equipped with a separate ACEG conductor, the integrity of the ACEG system upstream from the enclosure shall be verified. This is done by determining whether an acceptable type of conduit or raceway has been used and by verifying the tightness of the fitting(s) used to fasten the conduit or raceway to the enclosure.

3.2.3 For existing distribution systems not equipped with a separate ACEG conductor, only the following types of conduit or raceway shall serve as an ACEG conductor:

a) Electrical metallic tubing (EMT)

b) Intermediate metal conduit (IMC)

c) Rigid metal conduit

d) Metal raceways listed for grounding.

Note: If none of the above is present in the upstream feed to the enclosure, no circuit shall be extended from the enclosure until corrective action has been performed.

3.2.4 The ACEG conductors being added shall be terminated to the enclosure by one of the means described above.

3.2.5 If more than two ACEG conductors are being added (typically at a distribution panel), it is preferable to add a ground bus to the panel. This bus may be bonded to the panel using its mounting screws provided the paint is removed from the mounting surface of the panel and NO-OX-ID “A” anti-corrosive compound is applied to the bare metal.

4. COMMUNICATION SYSTEMS & MISCELLANEOUS EQUIPMENT

4.1. Frames, Bays, Cabinets and Units

4.1.1 All frames, bays, cabinets and units shall be properly grounded.

4.1.2 When a unit in a frame, cabinet or other enclosure requires a separate grounding conductor from the unit, the grounding conductor shall be extended from the unit to one or more of the following:

a) A crimp type parallel tap to a grounding conductor of equivalent or larger size within the enclosure

b) The same point of connection on the enclosure metalwork as the framework grounding conductor if of equivalent or larger size

c) A grounding terminal (wire-wrap, solder, etc.) within the frame or cabinet

d) A crimp type parallel tap to a grounding conductor of equivalent or larger size outside the enclosure.

4.1.3 The 1" galvanized pipe often used as a means of support between the framework and the auxiliary framing may be used as the lineup grounding conductor for the extension of existing applications only. This method is not allowed for new lineups.

4.1.4 The external chassis ground, if provided on a unit, shall be utilized to ground the unit, except where AT&T standard drawing indicates that the chassis ground connection is not required. If the AT&T standard drawing indicates that a chassis ground is not required, a copy of the drawing shall be left in the yellow wallet.

4.1.5 Frame extensions shall be bonded to the existing frame via the threaded nut and bolt assemblies connecting the two sections. When frame extensions are provisioned with a #6AWG bond, this bond shall also be used.

4.1.6 BDFBs with an insulated or external battery return bus bar shall be grounded with a #1/0 AWG conductor from the framework to the horizontal equalizer or CO ground bar, whichever is closest.

4.1.7 BDFBs with non-insulated battery return bus bar shall be grounded with a 750kcmil conductor from the return bus bar to the horizontal equalizer or CO ground bar, whichever is closest.

4.1.8 Equipment aisles shall be grounded with a minimum #6 AWG aisle ground conductor connected to the horizontal equalizer serving only one side of an aisle and with a maximum footage of 50 feet from the horizontal equalizer.

4.2. Conduits, Raceways, and Other Bonds to the MGB/GWB

4.2.1 The Main Ground Bus (MGB) shall be within 1 floor of the isolated ground plane frames it serves.

4.2.2 All Common Bonding Network (CBN) grounding conductors shall be connected to the CBN side of the MGB. All Isolated Bonding Network (IBN) grounding conductors shall be connected to the IBN side of the MGB.

4.2.3 Metallic conduits and raceways containing ac circuits serving isolated bonding network equipment shall be routed near the MGB and bonded to the CBN side of the MGB/GWB. The ACEG conductor in the conduit shall also be bonded to the CBN side of the MGB/GWB.

4.2.4 The bond to the MGB/GWB shall be made using a minimum #6 AWG conductor no more than three feet in length. Figure H-3 shows one possible method to bond the conduit and ACEG conductors to the MGB/GWB. A mechanical connector may be used to create a collection point to provide a means to bond ACEG conductors, conduit, raceway and junction box (if used) and the #6 AWG bond to the MGB/GWB.

4.2.5 After bonding to the MGB, conduit within the IBN network may contact isolated bonding network metalwork, but it shall remain insulated from contact with members of the common bonding network.

4.2.6 All metallic conduits and raceways containing AC circuit conductors shall be intentionally bonded together to form an electrically continuous enclosure. Insulating bushings, non-conductive unions, or any similar material or methods shall not be used in metallic conduits or raceways to interrupt their continuity.

4.2.7 Every conductor with continuity to both the common bonding network and the isolated bonding network, such as the shield of a coaxial cable, shall pass through the ground window and be bonded to the MGB/GWB with a conductor no longer than 3 feet.

4.2.8 The MGB may be mounted on cable rack, a column, a wall or any other location that provides adequate cable access.

a) The hardware securing the MGB shall provide electrical insulation from any metallic object to which it is mounted.

b) A #6 AWG bonding lead shall be installed between the MGB and any metallic object to which it is mounted.

4.2.9 All components of an isolated bonding network equipment system shall be referenced (connected) to ground only via the MGB.

4.2.10 When the battery return bus bar of the power plant consists of one or more straight sections of bus bar longer than six feet, the MGB may be established at any point along the bus bar.

a) Battery return conductors serving common bonding network loads shall be terminated on the battery return bus bar within the boundaries of the MGB.

b) Battery return conductors for isolated bonding network loads shall be terminated on the remaining portion(s) of the battery return bus bar.

4.3. Isolated Bonding Network Tests

4.3.1 Each frame or group of frames in the isolated bonding network shall have isolation tests performed in accordance with manufacturer's instructions.

4.3.2 It is an objective that at the completion of new switch (or other IBN equipment) installations, no more than 1 ampere of AC or DC current shall flow on any grounding conductor from IBN equipment as measured at the MGB termination

a) The installer shall use a clamp-on ammeter to measure the DC and AC amperage on the lead(s) from the equipment Isolated Bonding Network (IBN) to the isolated connection at the MGB. The installer shall record this reading on a Test Record Form and place a copy in the yellow wallet.

b) The vendor shall take corrective action to reduce readings greater than 1 ampere before the equipment is turned over to AT&T unless the AT&T LEC approves the higher value.

4.3.3

a) For existing IBN installations, it is recognized that ongoing equipment installation and removal activity by others may cause undetected grounding violations. These grounding violations could cause current flow on conductors between the IBN equipment frames and the MGB to exceed the 1 ampere requirement established for new installations. Accordingly, at the start and completion of all growth additions or modifications involving IBN equipment (i.e. frame, bay, shelf, circuit pack) the vendor shall measure the AC and DC current on all grounding conductors connected from IBN equipment frames to the MGB. Depending on the manufacturer and size of the IBN installation, there may be multiple conductors.

b) These measurement(s), along with date and time, shall be recorded on a test record at both the beginning and end of the job with the recorded values also given to the AT&T LEC. A copy of this test record shall be filed in the yellow wallet. It is recommended that this requirement be made part of the local Method of Procedure (MOP) that describes how this work will be completed.

c) There shall be no change between the current measurements before and after the job completion. This will verify the IBN equipment supplier did not create grounding violations as part of the installation activity. It is recognized that there may be subtle variations in the current measurements due to central office traffic conditions that exist at the time the job-beginning and job-ending measurements are taken. Therefore, the

beginning and ending current measurements may be different but the ending reading shall not increase by more than 5% from the beginning reading.

d) Depending on the beginning and ending current measurements, a variety of actions may be appropriate. A summary of conditions and suggested actions appear in Table H-3 below

Table H-3

CONDITION	SUGGESTED ACTION
Beginning reading ≤ 1 ampere	Proceed with job installation
Ending reading ≤ 1 ampere	Proceed with job close out
Beginning reading >1 & ≤ 10 amperes	Proceed with job installation.
Ending reading >1 & ≤ 10 amperes and within 5% of beginning reading	Proceed with job close out
Ending reading >1 & ≤ 10 amperes and greater than 5% of beginning reading	Vendor shall take corrective action[1]
Beginning reading > 10 amperes	AT&T to take corrective action[1,2]
Ending reading > 10 amperes	Vendor shall take corrective action[1]

[1] Corrective action includes investigation and modification of facilities as necessary to reduce the beginning current readings to 10 amperes or below or to reduce the ending current readings to within 5% of the beginning reading.

[2] It is an AT&T objective that the timing of growth additions occurs such that the jobs are completed and ready for service at the same time the additional capacity and/or capabilities are needed. If AT&T were to take action to correct bonding and grounding problems and this action caused a delay in the start and completion of the growth addition, this corrective action could prove counter productive. It is therefore advisable that AT&T personnel take preliminary current measurements approximately 3-6 months in advance of the job start in order to correct known problems in advance of the scheduled job start.

4.4. Insulation for Isolated Bonding Network Equipment

4.4.1 Insulating material shall be installed between a metallic object that is part of the isolated bonding network and material securing or fastening it to a metallic object that is part of the common bonding network.

4.4.2 Any metal detail extended above isolated bonding network equipment to support an object that is part of the common bonding network shall use insulation material to maintain separation between the two bonding networks.

4.4.3 Conduits that are part of an isolated bonding network shall be insulated from contact with common bonding network objects using two wraps of sheet fiber or bus bar insulators placed at all contact points.

4.5. Foreign Object Bonds

4.5.1 Common Bonding Network conductive apparatus located within 7 feet of the Isolated Bonding Network shall be bonded to the MGB/GWB with a No. 6 AWG conductor. Other large conductive objects (not associated with any network) that personnel may contact during their normal work activities while still in contact with an IBN device shall be bonded to the MGB/GWB. The CBN conductive apparatus and objects that shall be bonded include:

a) **Equipment Frames** – One No. 6 AWG is C-tapped or H-tapped to the lineup ground cable over each lineup of frames that are within 7 feet.

b) **Metallic stands, cabinets and desks** - Freestanding items placed in fixed locations such as metallic stands, desks and cabinets shall require bonding. Cabinets that are anchored to the walls or floor shall be bonded as well as all metallic spare circuit pack cabinets.

c) **Ironwork** - Auxiliary framing, cable rack, threaded rods, stanchions, cable hole hardware, and other metallic supports and details shall be considered one unit; therefore, only one bond to the ironwork is required. This bond shall be in a central location over the switch. In the event that different levels of auxiliary framing or cable rack are not interconnected by threaded rod or other metallic details over the isolated ground plane area, each level will be considered a separate unit and will require individual ironwork bonds.

d) **Lighting fixtures -** Lighting fixtures and the associated conduit are considered one unit and, therefore, only one bond to a lighting fixture is required.

e) **Air ducts** - When air ducts are separated by nonmetallic fittings, each section of duct shall be bonded; otherwise, the entire duct system will be considered one unit and only one bond is required.

f) **Metallic raceway or conduit** - This includes conduit providing AC to building equipment and/or IBN equipment areas, and conduit used to run alarm wiring. Each conduit run shall be bonded only once. Two-hole grounding lugs shall be used by installing the Burndy-type GAR-TC Ground Connector, or installing two conduit clamps (refer to Figure K4). If several conduit runs are mechanically connected together, such as at the power distribution cabinet, a conduit box, or via conduit clamps secured to a unistrut support, only the cabinet, box or support requires the bonding connection, not the individual conduit runs.

g) **Building fixtures** - Large volume conductive objects such as air-conditioning units, AC power distribution cabinets, water coolers, water pipes, radiators, door frames and window frames shall be bonded. Doors and doorframes are considered one unit and do not require individual bonds. Pipes shall be grounded per figure K-4. Small Items that are not normally touched by personnel or that are generally considered portable do not require bonding. This includes fire extinguishers and holders, light switch and outlet receptacle cover plates, wastepaper baskets, desk lamps, venetian blinds, signs, dropped ceiling supports, etc.

4.5.2 Based on the specific building configuration and the number of foreign objects that require bonding, one or a combination of the following methods shall be used to accomplish the bonding of foreign objects. For all applications, "daisy chain" connections shall **not** be used:

a) Collection Bus Bar - When there are a number of foreign objects to be bonded, a collection bus bar can be used to gather the # 6AWG conductors from the foreign objects. A # 6AWG conductor shall also be used to connect the collection bar to the ground window. This method helps to minimize the number of terminations on the MGB/GWB. See Figure H-1.

b) Collection Conductor - This method is similar to the collection bus bar above except a # 6AWG collection conductor will be used to gather the # 6AWG conductors from multiple foreign objects. Each conductor from the foreign objects shall be connected to the collection conductor using compression C-tap or H-tap connectors. The collection conductor can then be terminated on a collection bus bar or directly on the MGB/GWB. See Figure H-2.

c) Direct Connection - When there are a limited number of foreign objects to be bonded, a direct connection can be made between the foreign object and the MGB/GWB using a # 6AWG conductor.

5. RADIO SITES AND EQUIPMENT

5.1. Interior Ring Ground System

5.1.1 The peripheral conductor (also referred to as the "interior ring" or "halo ground") need not be installed as a single continuous conductor. Unnecessary splices shall be avoided, but when installation is simplified by installing the peripheral conductor in segments, and segments are joined by an exothermic weld (preferred) or crimp type parallel connector, such segmentation is permitted.

5.1.2 Routing of the peripheral conductor through metallic objects that form a ring around the conductor, such as metallic conduits or sleeves through walls or floors, shall be avoided whenever possible. Non-metallic material such as PVC conduit is preferred for floor or wall penetrations. If non-metallic conduit is prohibited by local code, the peripheral conductor shall be bonded to each end of the metallic conduit.

5.1.3 To minimize impedance and incident of arcing, the peripheral conductor shall be installed with a minimum number of bends. Bends shall be made with the greatest practical radius, with a preferred radius of no less than 1 foot. When this is impractical, the minimum radius shall not be less than 6 inches. Use of 90-degree bends to avoid obstructions shall be avoided when lesser bends (e.g., 45 degrees) can be adequately supported.

5.1.4 The peripheral conductor shall be run exposed to allow inspection of the system and to connection of branch conductors. PVC conduit shall not be used for support.

5.1.5 The peripheral conductor shall be located at a height from the floor that allows for convenient bonding of supplementary conductors. For 9'-0" frames, the recommended height is 9'-8".

5.1.6 Supports shall be provided at an interval of between 12 and 18 inches. Extra supports may be provided where the peripheral conductor may be distorted, such as at bonding points. When the peripheral conductor is not located on a wall, it shall be supported from cable racks or auxiliary framing channels.

5.1.7 Supplementary conductors may be supported from cable rack stringers or framing channels using 9-ply waxed polyester twine, cable ties, clamps or clips. If clamp or clip supports are used, a type that does not require drilling of channels and stringers is preferred. All supports shall be placed at an interval of 12 to 18 inches. Removal of paint from the channel or stringer is not required when clamps or clips are used. Scratches in the finish shall not be painted, and clamps or clips shall not be painted. A job-fashioned detail may be used to route the conductor around obstructions at cable rack junctions or other points interfering with the conductor.

5.1.8 To minimize impedance, special attention shall be paid to the direction of turns at all junctions of supplementary and peripheral conductors. At the junction nearest a hatch plate, the supplementary conductor shall turn in the direction of the hatch plate. The other end of the conductor shall turn in the opposite direction, toward a bond between the exterior ring ground and the peripheral conductor more remote from the hatch plate than the connection of the supplementary conductor.

5.1.9 When there is no significant difference in the length of the bond paths to a hatch plate from either end of a supplementary conductor, both ends shall turn in the direction of the hatch plate. When the building is equipped with more than one equipped hatch plate, the end of the supplementary conductor shall turn in the direction of the nearest hatch plate.

5.1.10 If one or more hatch plates are not equipped with waveguides, the supplementary conductor shall turn in the direction of the nearest equipped hatch plate. When coax or waveguide is added to the unequipped hatch plate, a second bond shall be made at the turn, in the opposite direction, to create a bi-directional turn. Note: Where doubt exists as to the correct direction for a turn, a bi-directional arrangement may be used. Universal application of bi-directional bonds is not recommended.

5.2. Unit Bonds

5.2.1 Grounding conductors routed along interior walls and units located next to such walls may be in proximity to other conductors or units mounted on the other side of the wall. When the peripheral or supplementary conductors that run on either side of a wall are bonded together at both ends, intermediate bonds may be omitted. Bonds to conductors on both sides of a wall shall be made to objects such as conduits or pipes that penetrate the wall.

5.2.2 Bends shall be made with the greatest practical radius. The bend radius shall not be less than 1 foot.

5.2.3 Where unit bond conductors join peripheral or supplementary conductors, they shall turn in the direction of the nearest hatch plate. A single conductor connecting two units to a peripheral or supplementary conductor may be used without regard to the direction of turns.

6. POWER PLANT GROUNDING

6.1. Frames, Cabinets and other Components

6.1.1 All frames, cabinets and other components of a power plant shall be equipped with a minimum #6 AWG to the CO GRD System. This includes frames in a power board line up, rectifier bays, metal battery stands, etc.

6.2. Grounding Conductor

6.2.1 The power plant line up conductor shall be sized to accommodate the maximum expected primary distribution. For 600A distribution, the power plant line up conductor shall be a #1/0 AWG minimum and shall be connected to the nearest:

a) DC System Grounding Conductor

b) MGB (when MGB is part of the power plant battery return)

c) Horizontal Equalizer of equal or greater size

d) CO GRD or OPGP bus bar DCEG conductors for power plant frames, cabinets and other equipment shall be branched from a power plant lineup conductor. A typical power area grounding arrangement is shown in Figure 3-1.

6.2.2 The DC system Grounding Conductor extends from the battery return bus bar to the CO GRD (or OPGP) for all power plants except shared power plants with a remote MGB. This shall be a 750 kcmil conductor.

6.2.3 For any equipment frame, cabinet or other enclosure containing rectifiers, the minimum size for a DCEG conductor shall be #6 AWG. Table H-4 below shall be used to determine the size of the framework ground conductor based on the size of the output rating of the largest rectifier in the framework. The current limiting or over-current protection feature of rectifiers may not activate until 110% of the rated current output is reached. For example, a 400-ampere rectifier may not shut down until reaching 440 amperes. The conductor size in Table H-4 is based on Table 250-122 from the NEC.

Table H-4

Rectifier/Inverter Output Rating (Amperes)	Rectifier/Inverter Current Limit (Amperes)	DCEG Conductor Size:
Up to 100	Up to 110	6 AWG
200	220	4 AWG
400	440	2 AWG

6.2.4 The DCEG conductor for any DC-to-AC inverter shall be a minimum #6 AWG.

a) Table H-4 shall be used to determine the minimum size for the DCEG conductor based on the rating or setting of the DC input circuit's over current protective device. This requirement applies to all stand-alone inverters and to all bay-mounted inverters. This DCEG conductor is required in addition to the ACEG conductor for the AC input and/or output circuits.

b) If the inverter is the source of a separately derived system, this conductor shall be required in addition to the Grounding Electrode Conductor.

6.2.5 Power Plants shall be grounded per Figure H-4

TABLE H-1 – SUMMARY OF CHANGES IN SECTION H

Change	Item in 11/1/05 Issue	Item in this Issue
Revised	1.1.5 b)	1.1.5 b)
Deleted		
Added		

FIGURE H-1 - Using a Collection Bus Bar to Bond Foreign Objects

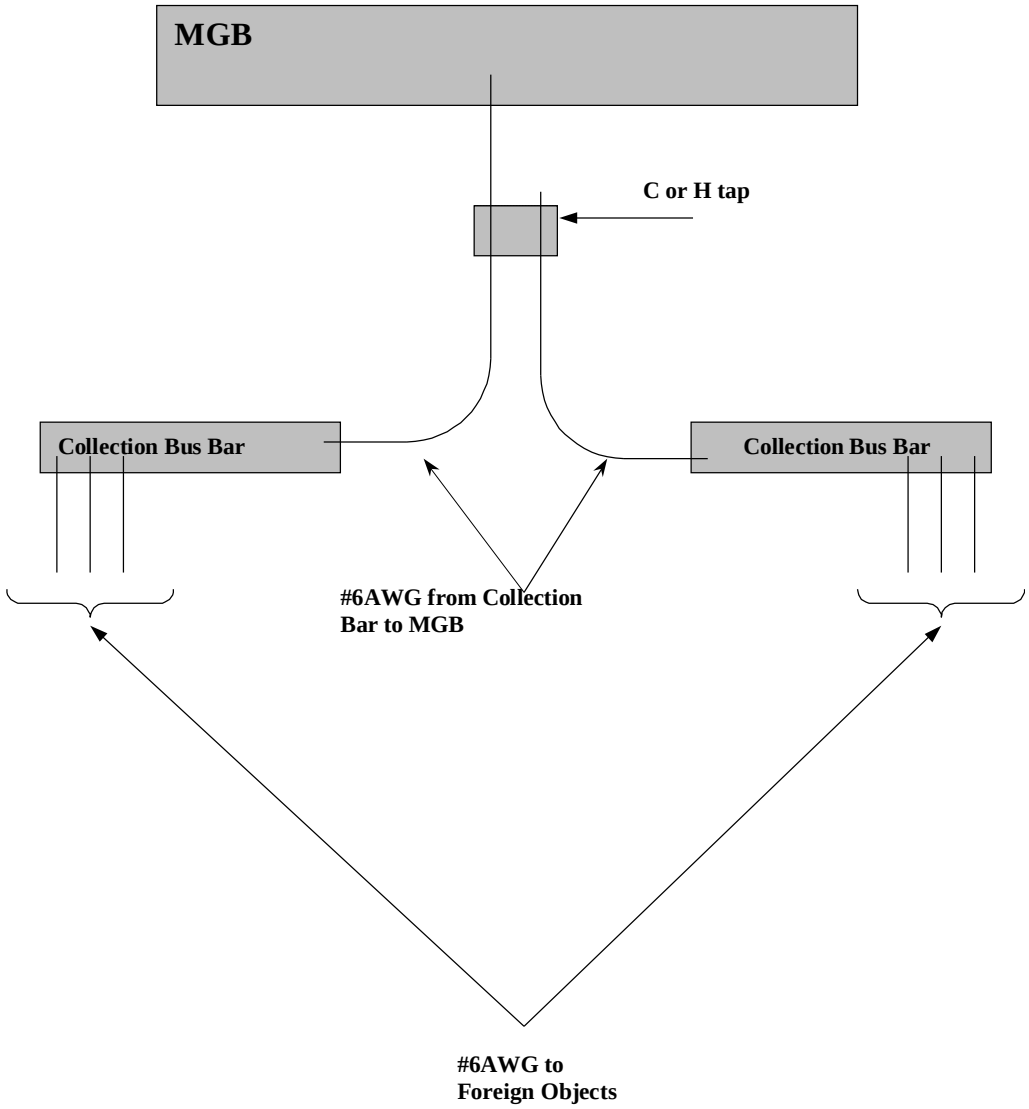


FIGURE H-2 - Using a Collection Conductor to Bond Foreign Objects

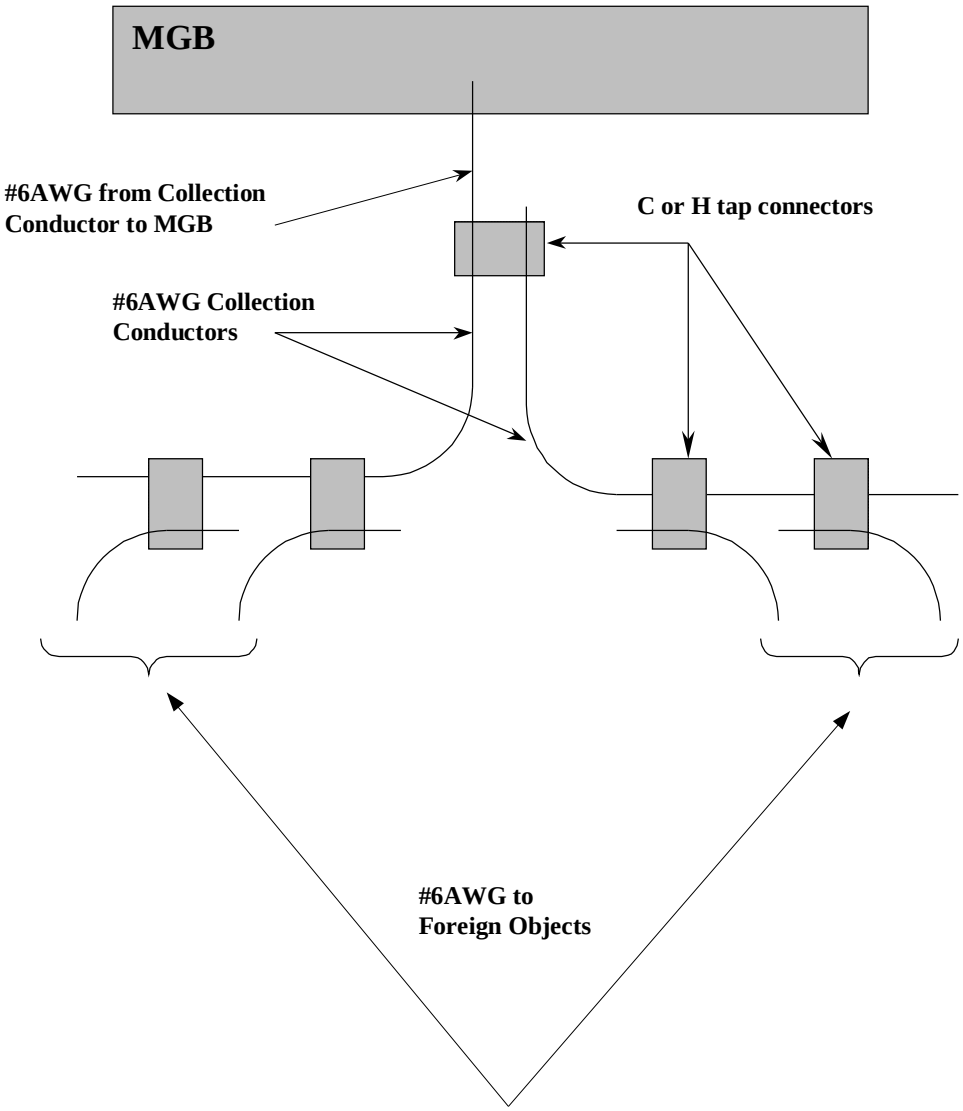


FIGURE H-3 - BONDING OF CONDUIT AND ACEG CONDUCTORS TO MGB/GWB

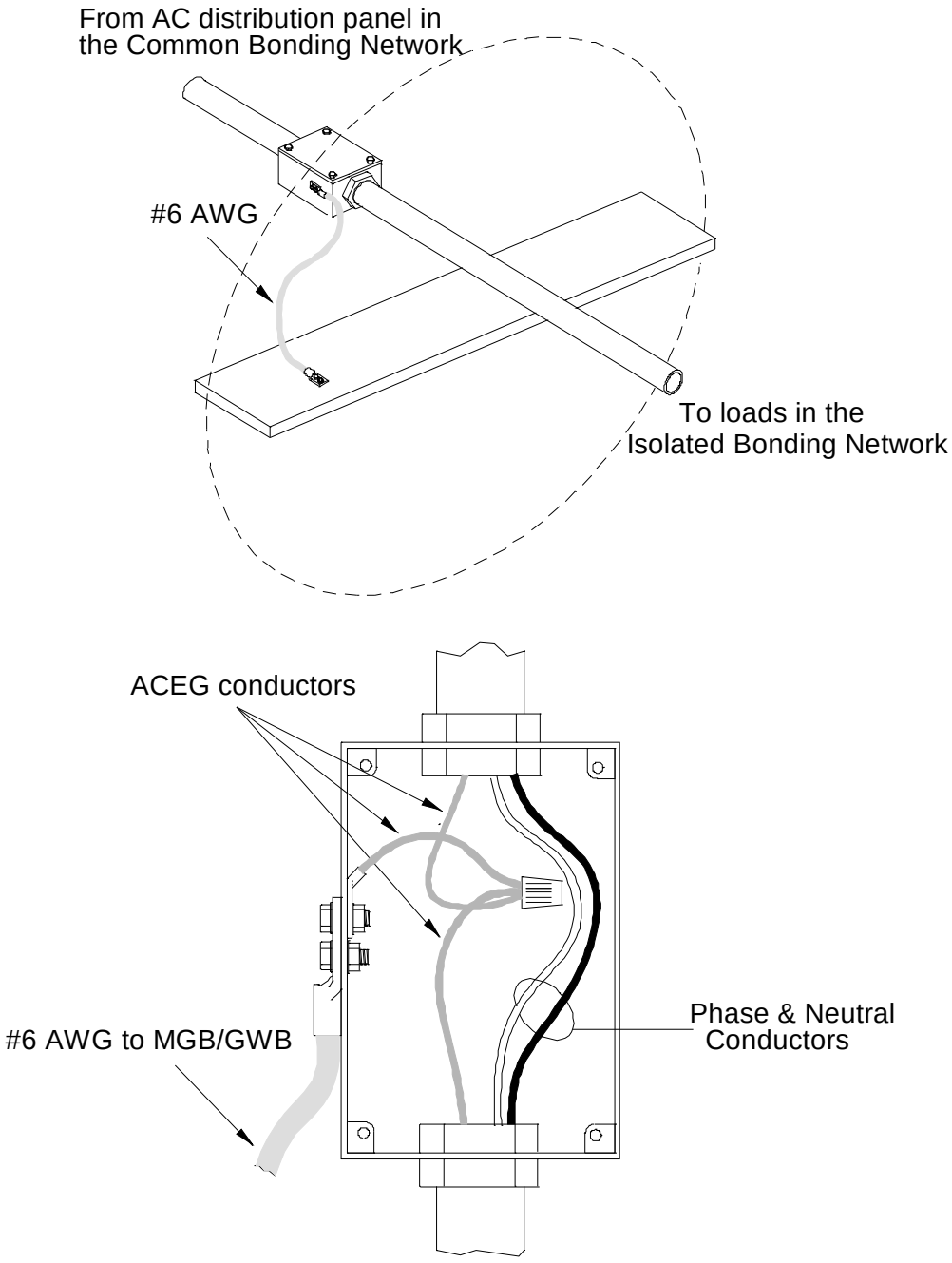


Figure H-4 Typical Power Plant Grounding Arrangement

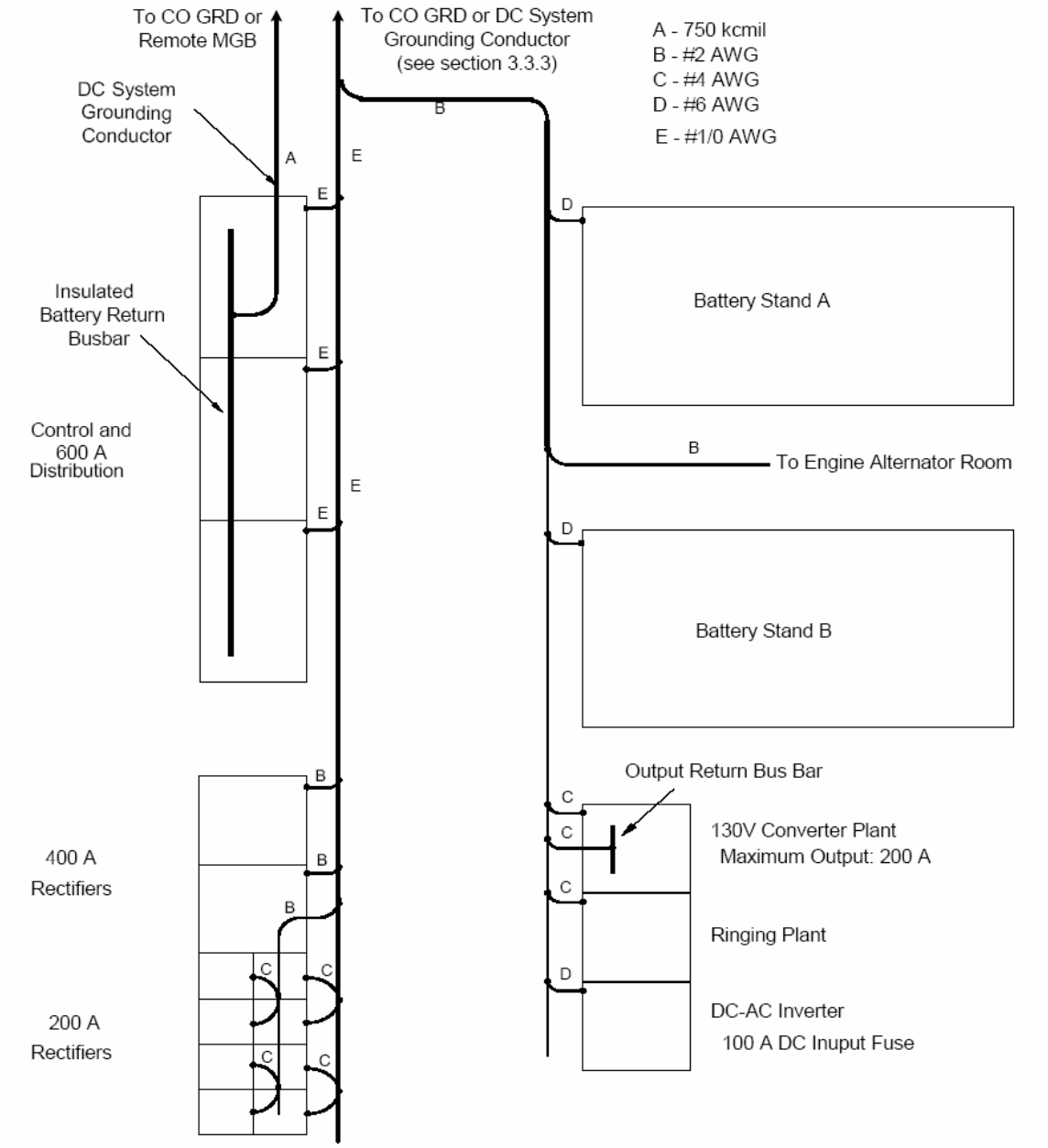
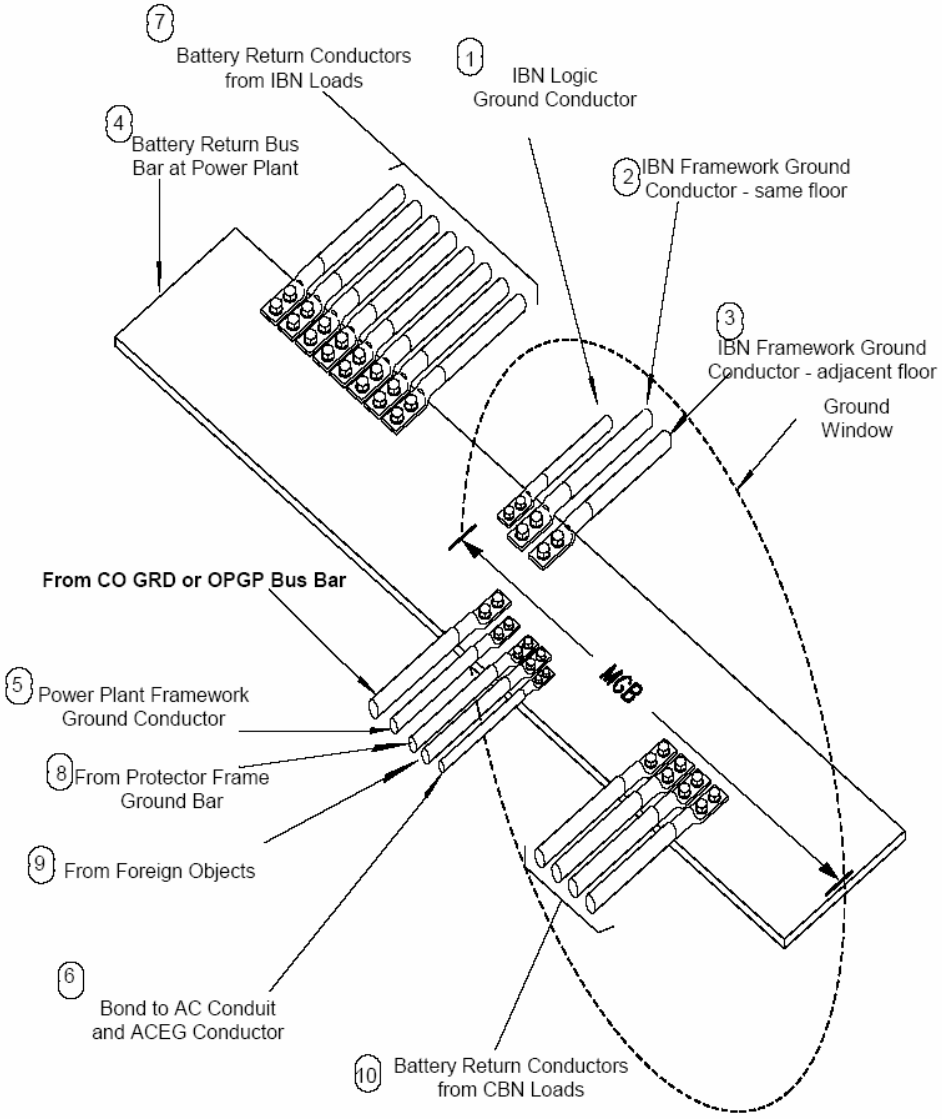


Figure H-5 MGB Sequencing When the MGB is Part of a Power Plant's Battery Return Bus (Collocated)



[END OF SECTION]

SECTION I -- IRONWORK

CONTENTS PAGE

1. GENERAL

1.1. Introduction

1.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all equipment added, rearranged or modified is properly installed and in conformance with AT&T LEC installation specifications.

1.1.2 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications

1.1.3 This section covers the general requirements for the location, assembly and erection of cable and relay racks.

1.1.4 Changes in this issue of Section I are summarized in Table I-1.

1.1.5 This section delineates workmanship requirements. The following Bell Service Practices provide additional assembly details:

ATT-TP-76201	Hardware Products and Materials Specifications
BSP 800-000-101MP	Anchoring Requirements
BSP 800-000-102MP	Equipment Framework Design Requirements
ATT-TP-76305	Cable and Wire Installation and Removal Requirements - Cable Racks and Raceways
ATT-TP-76408	Auxiliary Framing And Bracing Requirements
ATT-TP-76409	Network Facility - Cable Rack Requirements
BSP 800-006-152MP	Floor Stanchion Supported Cable Rack System Requirements
BSP 800-068-150MP	Equipment Framework Support Requirements
BSP-800-068-151MP	Storage Unit Bracing Requirements

2. REQUIREMENTS

2.1. General

2.1.1 All ironwork installation described in this section shall conform to the AT&T LEC seismic requirements. Except when noted otherwise, the requirements stated herein apply to all seismic risk zones.

2.1.2 Cut ends of auxiliary framing, cable racks, bolts, etc., shall have sharp or jagged edges removed.

2.1.3 Cut ends and damaged painted surfaces shall be repainted.

2.2. Auxiliary Framing

2.2.1 Auxiliary framing shall be uniform in length, at the correct height, properly located and level.

2.2.2 Clip type or through bolt splices can be utilized only in low seismic areas, If clip type splices are utilized they shall be:

a) staggered at alternate runs between supports, horizontally and vertically

b) Limited to one splice between supports.

2.2.3 Where the ends of low level auxiliary framing (first level above the frame work) extends beyond a support, the ends shall be equipped with a rubber finishing cap.

2.2.4 When short sections of auxiliary framing are used below the regular framing, rubber finishing caps shall be installed on the exposed ends.

2.2.5 Superstructure bracing shall be installed within the 30/60 degree slope maximum.

2.2.6 There shall be a minimum 5 inch clearance between the ends of auxiliary framing and any building surface or apparatus (e.g., HVAC ducting). Any building surface or apparatus shall be installed with a minimum 5-inch clearance to the auxiliary framing.

2.2.7 Auxiliary framing shall be supported at intervals not to exceed 6 feet and shall not extend more than 30 inches beyond the last support. The support shall be:

a) From the ceiling using 5/8 inch threaded rods or

b) From the floor using 2 inch pipe stanchions or

c) Wall supports using batten boards or

d) Other approved methods.

2.2.8 Pipe stanchion floor flange shall be fastened to the floor with a minimum of two 1/4-20 flat head machine screws and associated floor anchors.

2.2.9 Auxiliary framing heights shall be measured from the floor to the bottom of the paired channels.

2.2.10 Auxiliary framing shall be installed in 20-foot sections unless otherwise specified.

2.2.11 When through bolt splicing is utilized for auxiliary framing channels, six feet and longer in length, they shall be drilled or punched with splicing holes at both ends before the auxiliary framing is installed into overhead environments.

2.2.12 Holes in auxiliary framing for splice purposes may be enlarged or elongated if, after drilling or punching, the holes do not line up with the splice. When the holes have been enlarged or elongated, flat washers shall be installed on splice bolts. The separation between the ends of spliced auxiliary framing shall not exceed 1/4 inch.

2.2.13 When a square tube floor stanchion system is used, it shall be installed in accordance with instructions given in BSP 800-006-152MP.

2.2.14 Auxiliary framing splices shall not be made past the last support.

2.3. High Seismic Risk Zone Requirements

2.3.1 Splices shall be the positive (through bolt) type.

2.3.2 The end of the auxiliary framing shall extend at least 3 inches beyond the last point of support. If the distance from the end of the auxiliary framing to the last point of support (e.g. hanger rod, brace or cable rack attachment, etc.,) is less than 3 inches, a 3/8”-16 or larger bolt shall be installed through the ends of the auxiliary framing.

2.3.3 Stiffening clips shall be installed on no more than 2-foot centers between auxiliary framing supports. Stiffening clips may be omitted at locations where an earthquake brace, cable rack, or other clipped fastening, of 1/2 inch or larger, has been located.

2.3.4 Cable racks supported directly by auxiliary framing shall be attached with two J-bolts at each support.

2.3.5 Auxiliary framing supported conduit shall not be extended to wall-mounted switches, lights, outlets, etc. Approved flexible conduit, i.e. JMC, or cable shall be utilized for this application.

2.4. Cable Racks

2.4.1 Where cable racks are directly attached to auxiliary framing, both stringers shall be bolted to the framing at each end of a run:

a) At intermediate points, only one J-bolt shall be required at each auxiliary framing intersection.

b) The J-bolts shall be staggered so that adjacent fastenings along the rack can be made on opposite sides of the rack.

c) When short pairs of auxiliary framing are used to support cable rack extending beyond regular framing, or are used for the support of a frame, two J-bolts shall be used.

2.4.2 Space between ends of cable rack stringer shall not exceed 5/8 inch at splices.

2.4.3 Except for transitions between levels, only one cable rack splice is permitted between any pair of supports and spliced sections are not permitted to extend beyond the last support.

2.4.4 Cable rack should be supported at 5 foot intervals and shall not exceed 6 feet.

2.4.5 Cable rack shall not extend more than 30 inches beyond the last support.

2.4.6 There shall be a minimum 5-inch clearance between the ends of the cable rack and any building obstruction.

2.4.7 Formed fiber tubing shall be placed on all hanger rods directly supporting cable rack. The tubes shall be long enough to adequately protect the cabling to the ultimate height of the cable build up.

2.4.8 Metallic cable rack pan shall be installed using the following guidelines:

a) All junctions shall be overlapped a minimum of 3 inches. The bottom section of “pan” shall not extend more than three inches past the common cross member.

b) Pans shall not extend past the end of the cable rack stringer or closing detail.

c) An overlapping arrangement of pans shall be utilized to avoid cutting of pans. The ends of pans that must be cut in the field shall be equipped with edge protection and have a 1/4” radius at their corners (refer to Part 8 and Fig. 22 of ATT-TP-76409).

d) Cable retaining horns on “panned” cable rack shall be installed on both sides of the cable rack on 18-inch centers, except at cable rack intersections where they shall be omitted/removed.

e) Pans on inclined cable racks are not permitted.

f) Installed cable rack horns that are not the straight formed wire design shall not be reused.

g) Horns installed on runs of cable rack shall have a common design, except that, straight formed wire horns may be used when extending existing racks that are equipped with a different horn design

2.4.9 Cable rack shall not be extended through a floor.

2.4.10 Distance between cable rack straps shall not exceed 9 inches. Additional support shall be provided as necessary to keep the cable from sagging.

2.4.11 The ends of cable rack sections shall be protected with rubber finishing caps or closing details.

2.4.12 Cable racks shall not be supported by their cross straps.

2.4.13 Vertical racks on walls or columns shall be supported at the floor and shall have intermediate support with a maximum spacing not to exceed 5 feet.

2.4.14 Cable racks placed on floors shall be fastened with Z-clips on the inside of the rack stringers, at intervals not to exceed 5 feet.

2.4.15 For horizontal cable runs, the cable rack shall be placed with the cross-straps upward. A cable rack with solid bar-type stringers, smaller than 25 inches in width, may be inverted to gain necessary cabling heights due to fixed obstructions. Cable rack with reinforced straps shall not be inverted.

2.4.16 The flat bar of a cable rack turn assembly shall be secured by simple stitching to the cable rack.

2.5. Conduits

2.5.1 Conduit shall be supported with material designed for the support of conduit, such as U-bolts, conduit clamps, conduit straps, etc. Hose clamps, cord, tie wraps, beam clamps (unless

supporting it directly to a beam), and other similar material shall not be used to support conduit.

2.5.2 AC conduit troughs shall be mounted and secured per the NEC and local municipality requirements.

2.5.3 Rigid metallic conduit, intermediate metal conduit, EMT or JMC cable etc. shall be utilized for all AC circuits.

2.5.4 PVC type conduit shall not be used as an AC raceway.

2.5.5 Rigid conduit and Electrical Metallic Tubing (EMT) shall be secured on a wall or ceiling every 10 feet and shall be supported within 3 feet of each outlet box, junction box, or cabinet. An outlet junction box or cabinet that is secured is considered a support. The use of EMT is permitted in applications where the EMT will not be subject to physical damage.

2.5.6 Liquidtight flexible metal conduit shall be secured and fastened to a support within 12 inches on each side of each outlet box, junction box, cabinet or fitting. No support is required when liquidtight flexible metal conduit is installed inside the base angle of frameworks. Three feet of unsupported liquidtight flexible metal conduit from a fitting is acceptable when flexibility of the equipment is necessary or (6 feet is allowable) when the liquidtight flexible metal conduit serves lighting fixtures. Cord/tie wrap may be used to hold liquidtight metal conduit in place within a frame (not for support).

2.5.7 JMC flexible metal conduit shall not be used as a main fixed raceway for power conductors, except where flexibility of the raceway is required.

2.5.8 Conduit serving a junction box that does not contain a device and does not support fixtures shall be supported within 36 inches of the box, on two or more sides. If a junction box contains a device, all conduit shall be supported within 18 inches of the box.

2.5.9 Conduits secured to other than a wall or ceiling shall be securely fastened at intervals not to exceed 6 feet. Conduit shall not extend more than 30 inches beyond the last support.

2.5.10 Unused knockouts in boxes and cabinets and all unterminated conduit ends and junction box covers shall be closed

2.5.11 Conduit shall be placed so as not to block future cabling, ladders and equipment.

2.5.12 Proper clearance from pipes, duct work or heat generating equipment will be maintained to eliminate possible damage to cable.

2.5.13 Insulated couplings shall not be installed in AC conduit or raceways.

2.5.14 Conduit fittings shall be tight.

2.5.15 Compression type fittings shall be used on EMT conduit. Screw type couplings are not acceptable.

2.5.16 All fluorescent type lighting fixtures over equipment areas shall be rigidly attached and shall not be supported with chains.

2.6. Frames, Bays, Battery Stands and Equipment Cabinets

2.6.1 All frames taller than 7'-0" shall be top supported by attachment to the office superstructure. Top supports shall be provided along equipment lineups at each location where a primary run of office superstructure crosses the equipment lineup. A minimum of two top supports is required for each group of frames that do not span two runs of primary office superstructure. A frame group, or group of frames is defined as any number of individual frames that are rigidly bolted or otherwise junctioned together to form a structurally continuous unit of frames.

2.6.2 Frames 9'-0" and taller use a one-inch galvanized pipe to supplement adjacent frame junctioning requirements and for alignment and grounding purposes. One-inch pipes shall be clamped to the underside of each frame's top angle at two locations. The V bolts shall be located to the left and right of frame center a minimum 12 inches apart. Any attachments to overhead framing shall be in addition to the pipe supports. One-inch galvanized pipes will be furnished in 20-foot lengths whenever possible. Extra length not used for current fastening of frames shall be left for future frames. A minimum of 15 inches of pipe shall always extend beyond the last frame installed for future growth unless that last frame is at the end of the lineup. The unused length of pipe shall be fastened to the auxiliary framing with frame support hardware above future frames. Where the pipe extends beyond the end of an existing or planned group of frames, it shall be fastened to the auxiliary framing with U bolts. The junction of the pipes shall be bonded in accordance with Section H of ATT-TP-76300.

2.6.3 When the 1 inch galvanized junction pipe extends beyond the end of the frame, the end of the pipe shall be capped with a rubber finishing cap.

2.6.4 A frame taller than 7'-0" installed as an individual frame, i.e. not junctioned to any adjacent frames, or installed with spacers on both sides, shall have at least two points of support to the overhead superstructure.

2.6.5 High seismic frames, 7 feet tall shall be secured with 4 floor anchors.

2.6.6 7 foot frames, bays or cabinets shall not be top supported except when adding to an existing 7 foot line-up that is top supported. Frames that are top supported shall be secured to the building floor with 2 anchors along the center line of the frame uprights.

2.6.7 7 Foot, Low seismic frames or frames installed that can not meet the high seismic framing requirements in BSP 800-000-101MP shall be secured with a minimum of 2 floor anchors in conjunction with top support. When this securing method is utilized all frames installed as individual frame i.e. not junctioned to another frame, or installed with spacers shall have at least 2 top supports to the overhead superstructure.

2.6.8 Unequal flange and network bay equipment frames taller than 7'-0" are secured by bracing to overhead auxiliary framing and floor anchored. Two floor anchors shall be placed as close as possible along centerline of uprights.

2.6.9 The uprights of adjacent frames and cabinets shall be joined together per manufacturer’s specifications and at the top and bottom to form a continuous lineup.

2.6.10 All frames, bays and cabinets to be installed shall be measured from reference points as identified on the floor plan.

2.6.11 Frames and cabinets shall be plumb and aligned to adjacent frames and cabinets to within 1/4 inch.

2.6.12 Frames and cabinets shall be level within 1/16 inch per foot. If shims are required, there shall be no more than a 1-inch shim stack.

2.6.13 If more than 50 holes in the floor are to be drilled for the job, the Installation Supplier shall scan for embedded metallic obstructions before drilling.

2.6.14 If an embedded obstruction (e.g., reinforcing bar) is encountered during floor drilling, drill another hole at an alternate location. If relocating the hole is not possible, contact the AT&T LEC equipment engineer.

2.6.15 Frames, bays, cabinets, etc. shall be bolted to the floor using AT&T LEC approved floor anchors.

2.6.16 Full height end guards and guardrail closings shall be installed on all frame uprights at each end of the lineup.

2.6.17 End guards shall be secured in the front and rear and at the top and bottom.

2.6.18 End panels or end shields shall be installed on all frame uprights not adjacent to another frame or a building obstruction

2.6.19 End guards, end panels or end shields that do not match the same depth or overall foot print of the adjacent bay framework shall require a transition device (guard rail closing detail). This transition device shall be required either on the front, rear or both sides of the end guard, end panel or end shield, whichever is appropriate

2.6.20 When the depths of frames are different, transition devices shall be used from one frame to the next

2.6.21 End guards, end panels and end shields shall be the same height as the frames they are installed on

2.6.22 When spacers, (i.e. spacer junction, frame extender, cable spacer, spacer box) are required between equipment frames, the space between frames shall include a base filler matching the guard box details of adjoining equipment frames and a full height filler panel covering the space between frame uprights (unless an AT&T standard drawing indicates that a filler panel Is not required for a specific project). The base filler shall be secured to the building floor with similar floor anchor hardware as used for equipment frame installation. The filler panel shall be secured to the equipment frame uprights with junction plates and mounting hardware at intervals no greater than 3 feet increments. Filler panel and base filler shall be finished to match color of equipment frames.

2.6.23 Hinged doors or covers of cabinets shall not bind with adjacent covers or doors to such an extent that any cover or door cannot be readily opened without causing the adjacent cover or door to move. In addition, hinged doors shall not come in contact with any working equipment.

2.6.24 When equipment frames or cabinets are associated with hot slides, they shall be bolted to the floor in the temporary location.

2.6.25 All equipment shelves mounted in frames, cabinets, or bays shall have a minimum of four screws used to secure the unit to the frame/cabinet/bay upright for shelves up to 50 pounds. A minimum of two additional screws for each 100 pounds or fraction thereof above the first 50 pounds shall be installed beyond the four screws. Exception: Single mounting space plate units may be mounted with two screws.

2.6.26 Battery stands, shall be secured with Hilti 16mm HSL anchors for high seismic risk locations or Hilti HDI ½ anchors for low seismic risk locations in accordance to quantities specified by the equipment manufacturer. Hilti 12mm HSL anchors in high seismic risk locations may be necessary under special circumstances with approval of Seismic Protection Engineer. For more information, refer to Section M of ATT-TP-76300.

2.6.27 BDFBs, DC power distribution bays, rectifiers, and other network power equipment bays shall be anchored with a minimum of 4 Hilti 12mm HSL size anchor.

2.6.28 Distributing frame blocks shall be installed with 4 mounting bolts when the holes on the distributing frame are available

2.7. Rolling Ladders And Tracks

2.7.1 Hanger rods or bolts used for direct support of ladder track shall be provided with cotter pins or self-locking nuts. Otherwise, the ends of conventional bolts shall be staked.

2.7.2 Ladder track shall be supported at approximately 5 feet intervals and not to exceed 6 feet.

2.7.3 Ladder track shall not exceed a maximum of 4 feet beyond the last track support.

2.7.4 The ladder stop bolt shall be installed a maximum of 3 feet beyond the last track support.

2.7.5 Ladder track supports, splices and handrails shall be free of burrs and sharp edges.

2.7.6 Handrails shall be located or relocated as follows:

a) When ladder serves distributing frame and other frames - locate to the side away from the frame.

b) When ladder serves frames on right side only - relocate to the left side.

c) When ladder serves frames on both sides - leave on the right side.

2.7.7 Rolling ladder shall have correct slant/direction with respect to the equipment lineup. Ladders will typically slant in a direction such that the foot is nearest the main cross aisle.

2.7.8 When a short section of track is required, the section shall be placed at some intermediate location in the track instead of at the end.

2.7.9 The track shall be assembled and aligned to ensure the proper operation of the ladder trolley and brake.

2.7.10 Sections of track shall be spliced as shown in Figure I-1. Figures I-2 through I-5 show additional ladder track details.

2.7.11 Ladder track shall be installed as level as possible.

2.7.12 Ladder stop bolt and bushings shall be installed on all ladder track ends and shall be equipped with a cotter pin or lock nut.

2.7.13 Ladder stop bolts shall be placed or relocated to ensure accessibility of equipment from rolling ladder.

2.7.14 Ladder stop bolts shall be placed or relocated so as to prevent the ladder from hitting anything (e.g., walls, water coolers, alarm panels, etc.).

2.7.15 Non-creep bolts shall be installed, burred and staked on all ladder track ends. If the track is extended, install a new bolt.

2.7.16 Ladder track splice screws shall be equipped with washer, burred and staked or secured with self-locking nut.

2.7.17 Fenders and wheel guards shall be provided on all ladders where they come into contact with the guardrail.

2.7.18 Brake shall be adjusted so that it operates properly.

2.7.19 Brake ropes shall be trimmed and clamped to remove risk of personal injury.

2.7.20 Ladders shall run free and clear of equipment.

2.7.21 Ladder tracks ends shall be equipped with rubber plugs.

2.7.22 A minimum clearance of 15 inches shall be maintained between the end of ladder track and walls, columns, etc., on the end toward which the ladder(s) slope, to facilitate installation and removal of the ladder trolley.

2.7.23 The gap between spliced ends of ladder track shall not exceed 1/8 inch.

2.7.24 Ladder track splicing sleeves shall be assembled with lockwashers and locknuts.

2.8. Threaded Rods, Bolts, Nuts, Screws And Cotter Pins

2.8.1 Bolts, nuts and screws used to secure parts or units shall be tight.

2.8.2 The appropriate size bolt or rod shall be utilized.

2.8.3 The Installation Supplier shall cut the end of a bolt or rod that extends into the equipment or wiring area, or presents a personnel hazard.

2.8.4 The exposed end of the bolt or rod shall not exceed the diameter of the bolt or rod, except where personnel safety or equipment protection will not be compromised.

2.8.5 Bolts, screws or rods shall not be more than one thread under flush.

2.8.6 Both ends of bolts, screws or threaded rods shall be free of sharp edges and burrs.

2.8.7 The tips of all cotter pins shall be bent back until resting against the rod or bolt to prevent injury.

2.8.8 Self-locking nuts that have been loosened or removed shall not be reused.

2.8.9 Split nuts shall not be used.

2.9. Unistrut Incorporated Within Auxiliary Framing

2.9.1 Where unistrut extends more than three inches beyond a clip or support, the unistrut shall be equipped with a finishing detail.

2.9.2 When additional unistrut is placed below the regular framing, the ends shall be equipped with finishing details.

2.9.3 There shall be a minimum 5-inch clearance between the ends of the unistrut and any building obstruction.

2.9.4 Unistrut sections shall have at least 2 supports unless otherwise specified. The supports shall be at intervals not to exceed 6 feet and shall not extend more than 30 inches beyond the last support.

2.10. Ceiling Hanger Rods

2.10.1 Hanger rods shall be inserted into ceiling inserts seven full turns

2.10.2 If ceiling inserts are rusty or filled with concrete, the inserts shall be cleaned out with a 5/8”-11 tap.

2.10.3 A 5/8”-11 hex nut and a 1-3/4 inch outside diameter washer shall be used at the ceiling on all hanger rods and bolts, regardless of ceiling construction.

2.10.4 When hanger rods are installed through ventilating ducts additional 1-3/4 inch washers and 5/8”-11 hex nuts shall be installed at the bottom of the duct. Add sealing compound to seal any air leakage.

2.10.5 Under no circumstances shall more than one splice be installed on a hanger rod. In no case shall threaded rod used for the support of mezzanine platforms be spliced.

2.10.6 Ceiling hangers shall be installed vertically plumb to within 2 degrees and hanger rod straight to within 1.5 inches over 5 feet run.

TABLE I-1 – SUMMARY OF CHANGES IN SECTION I

Change	Item in 11/1/05 Issue	Item in this Issue
Revised	2.6.23 2.6.24 2.6.25 2.6.26 2.6.27 2.6.28	2.6.23 2.6.24 2.6.25 2.6.26 2.6.27 2.6.28
Deleted		
Added	2.6.17 2.6.18 2.6.19 2.6.20 2.6.21 2.6.22	2.6.17 2.6.18 2.6.19 2.6.20 2.6.21 2.6.22

FIGURE I-1--SPLICING SLEEVES FOR LADDER TRACK

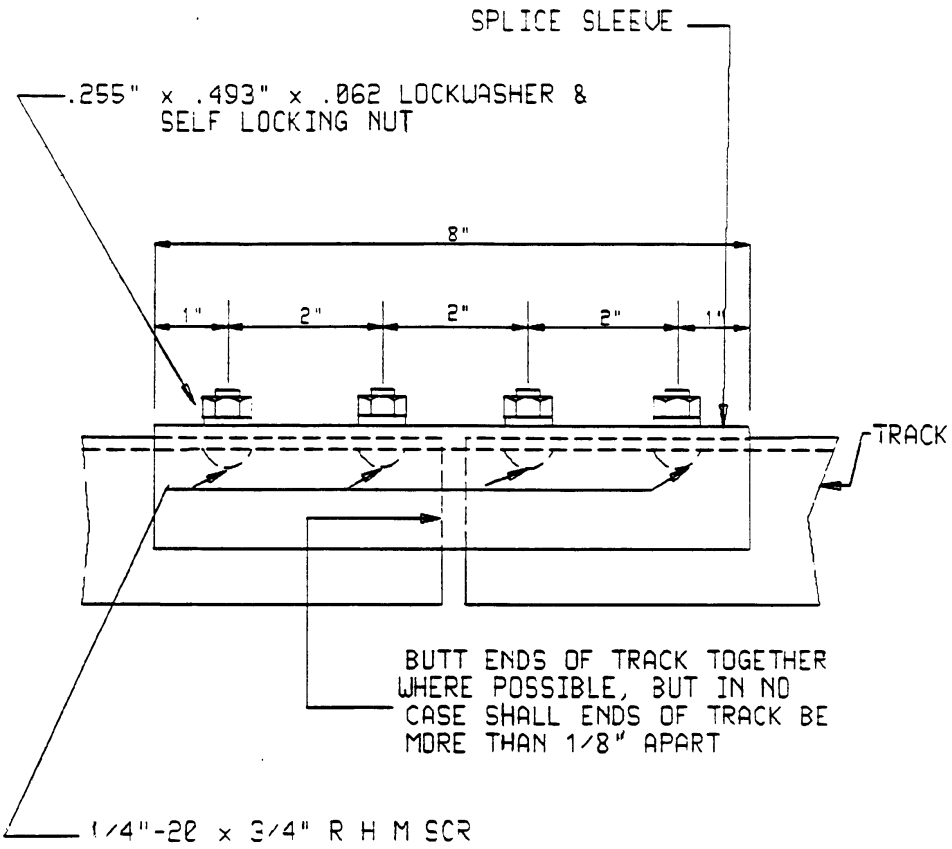


FIGURE I-2--TRACK SUPPORT BRACKETS

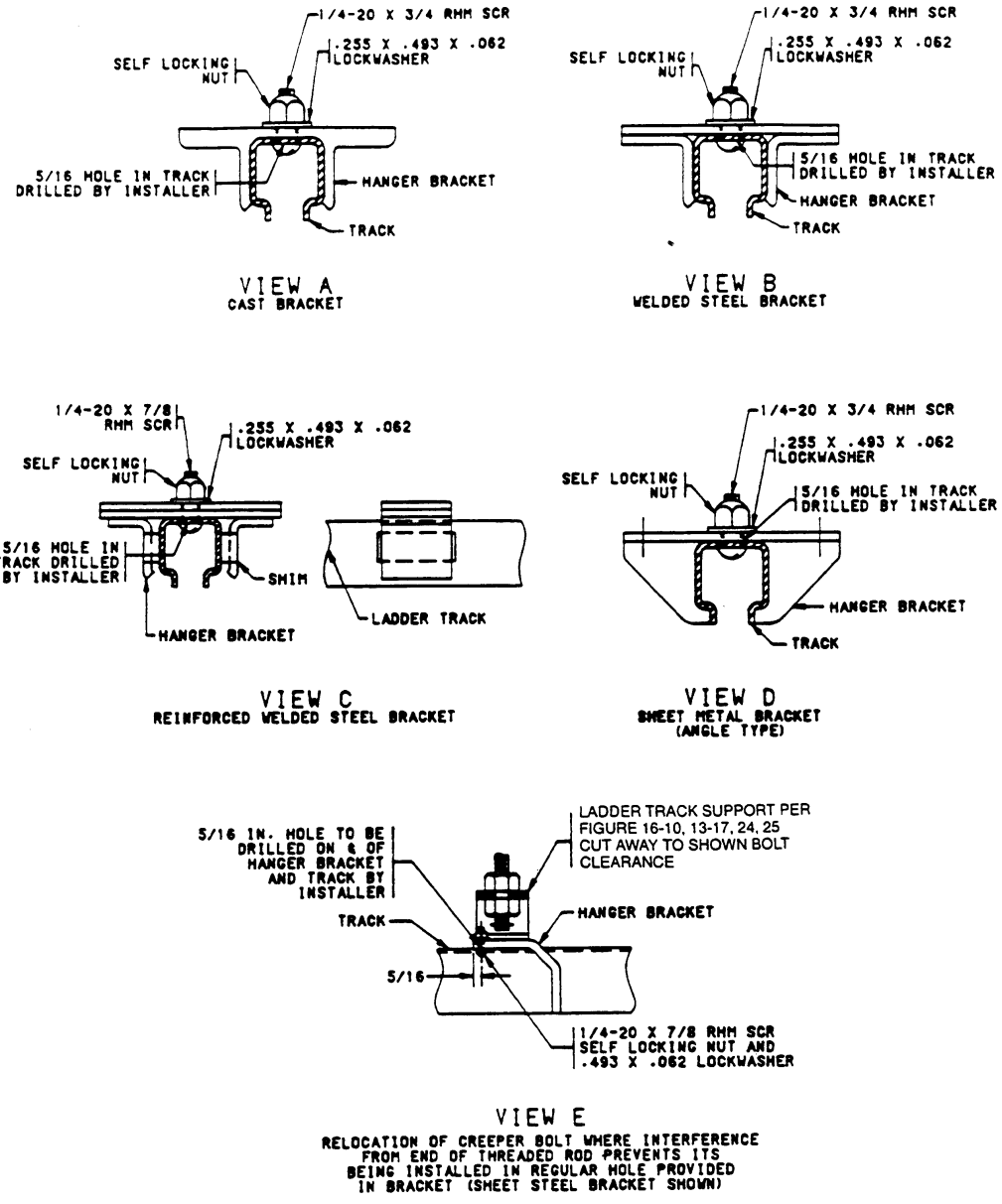


FIGURE I-3--LADDER STOP AT SUPPORT BRACKET

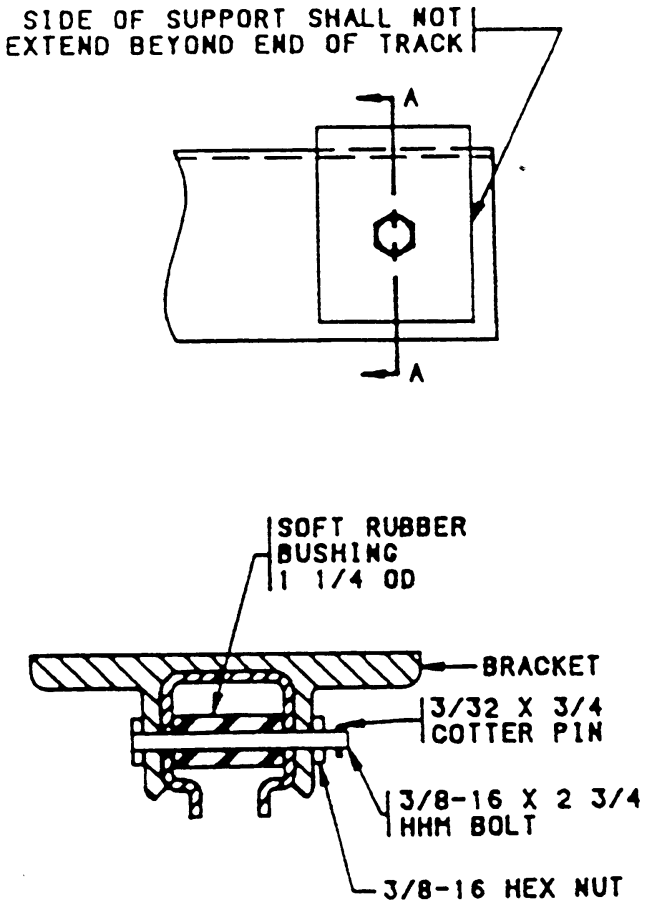


FIGURE I-4--TRACK SUPPORTED WITH SINGLE BAR DIRECTLY FROM CABLE RACK 2 FEET 1 INCH OR LESS WIDE

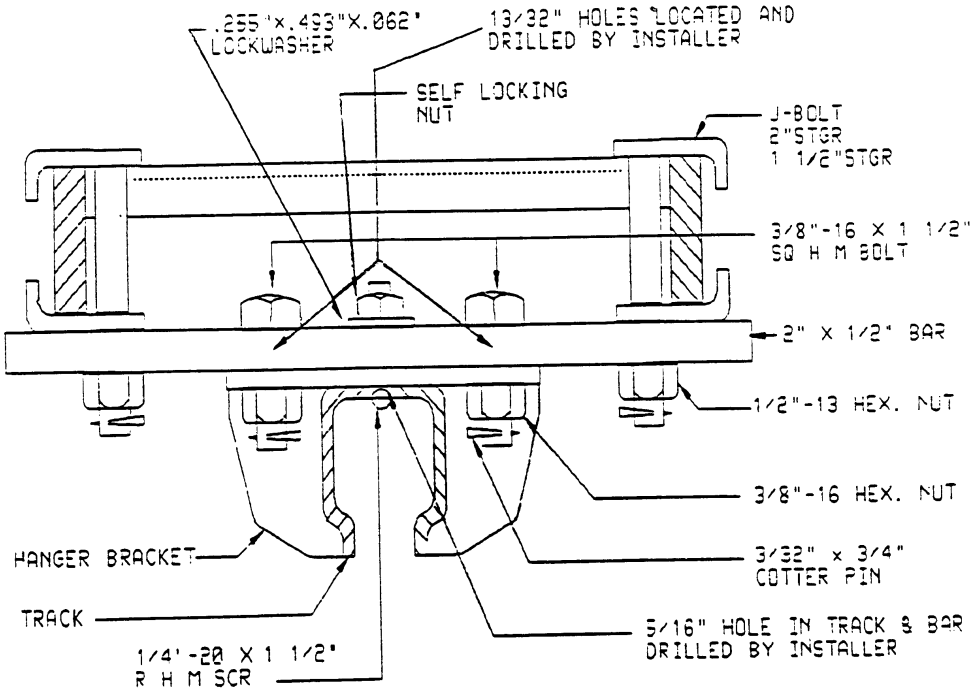
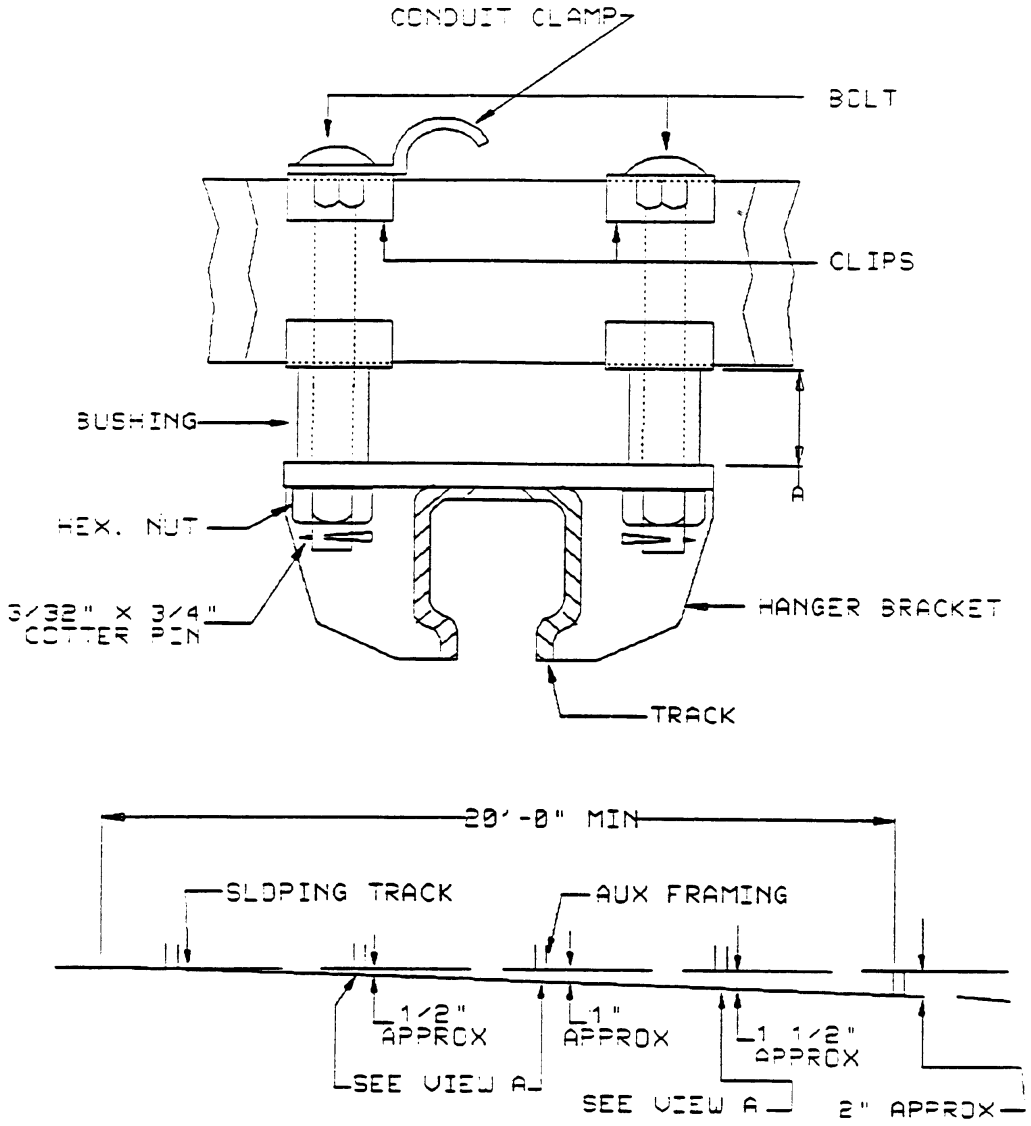


FIGURE I-5--TRACK SUPPORTED FROM AND AT RIGHT ANGLES TO AUXILIARY FRAMING - SLOPING TRACK - 2 INCH DIFFERENCE IN AUXILIARY FRAMING LEVEL



[END OF SECTION]

SECTION J -- CABLING

CONTENTS PAGE

1. GENERAL

1.1. Introduction

1.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all equipment added, rearranged or modified is properly installed and in conformance with AT&T LEC installation specifications.

1.1.2 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications

1.1.3 This section provides general and workmanship requirements pertaining to cable installation.

1.1.4 Changes in this issue of Section J are summarized in Table J-1.

1.1.5 Refer to the respective sections of ATT-TP-76300 for additional requirements for power cable (Section M), CO grounding cable (Section H) and fiber optic cable (Section O).

1.2. General Requirements

1.2.1 Standing on or applying excessive stress/pressure to cable on racks or equipment is not acceptable when installing, removing or securing cable and wire. Walking on top of installed cables shall be avoided.

1.2.2 Refer to Section F of ATT-TP-76300 for instructions on fire and smoke stoppage, which shall be applied when cables are installed through any penetration.

1.2.3 Refer to Section O of ATT-TP-76300 for instructions on fiber optic cable.

1.2.4 For cabling and panning purposes, vertical cable rack is defined as any cable racking that is not horizontal.

1.2.5 Only tinned copper cable shall be installed in the central office environment. Untinned wire is not approved for use in the central office except for CAT-5 and RS232 cables.

1.3. General Cable Routing

1.3.1 No deviations shall be made from the job cable routing specifications without the approval of the AT&T LEC Equipment Engineer.

1.3.2 Storing excess cable on or in cable racks, compartments or ducts shall be avoided, except for the following reasons:

a) When the excess cable is five feet or less.

b) When the excess cable is required for proper equipment operation the excess cable shall be distributed on or in cable racks, compartments or ducts so the pile-up is not concentrated at a single location.

c) When the excess cable is associated with equipment located in temporary locations and the excess cable will be used when the equipment is moved to its ultimate location, the excess cable shall be coiled banded, identified and secured to the cable rack above the equipment frame. This type of stored cable shall be repositioned on subsequent cabling operations to avoid burial.

d) When cable is equipped with apparatus that cannot be disconnected and reterminated in the field.

e) When storing all cable designated “Future” on the cable rack. Provide adequate length for ultimate termination.

1.3.3 Cables connectorized on both ends by the factory shall not be longer than 10 percent over the measured length for the route of the installed cable. The maximum additional length shall be 10 feet.

1.3.4 For formed or connectorized cable, the Installation Supplier shall install the connectorized or formed end of the cable first; then trim excess cable to the measured length for the route of the installed cable.

1.3.5 For bulk cable, the Installation Supplier shall install the cable and cut off the excess to the proper length.

1.3.6 Excess cable associated with installation of equipment in a temporary location (such as in preparation for a hot slide) shall be stored or removed as directed by the AT&T LEC Representative:

1.3.7 Cable slack shall not be stored on or near cable racks over distributing frames or DSX frames.

1.3.8 Cable shall be dressed away from sharp corners or edges and/or heat producing devices, and shall not interfere with the addition of future equipment.

1.3.9 Switchboard and power cables installed on vertical cable racks shall be limited so that the cable is not closer than 3 inches from the side of the cable hole.

1.3.10 The Installation Supplier shall support cable at cable rack breakoffs such that the maximum length of unsupported cable does not exceed 3 feet, except as follows:

a) Where cable to a distributing frame passes through a floor opening immediately under the frame, an unsupported length of not more than 4 feet measured along the shortest cable is permissible.

b) Vertical cables in floor openings do not require support within the opening.

c) Cable dropping off cable rack above distributing frames may be unsupported for a maximum length of 4 feet.

1.3.11 Cables shall not run over building obstacles (such as water pipes, conduit, air ducts, etc.).

1.3.12 Cable that has been previously in service shall not be reused unless directed otherwise by the AT&T LEC.

1.3.13 Cable shall exit/waterfall off the sides of cable racks at points of termination only. Refer to Figure J-7.

1.4. Cable Diversity Requirements

1.4.1 When diversity is required, cable shall be routed as described below, in order of preference.

a) Two separate and distinct cable routes between the network elements, via existing cable racks. No new racks shall be added just to provide diversity.

b) A common cable route with cables run on opposite sides of the cable rack. For ladder type cable racks, the cables shall be secured every third strap. When panned cable racks are provided, the cable shall be loosely tied to the inside of the cable rack stringer or the cable rack horn every six feet.

c) If the requirements listed above cannot be met, one of the cables shall be run in flex tubing/innerduct. Flex tubing/Innerduct shall be of the fire-retardant, solid (un-slit, unless split is specified) corrugated design having a maximum 1.25-inch diameter and shall be riser rated (minimum).

1.4.2 Diverse leads run vertically within a bay/cabinet shall be run down opposite sides of the bay/cabinet.

1.4.3 Diverse leads, to the same network element, shall not cross at any point if physically possible.

1.5. Temporary Installations

1.5.1 All temporary cabling and wiring shall be run, in order of preference, on:

a) Temporary racking

b) Cable straps

1.5.2 Cabling shall not be suspended by lacing cord or nylon cable ties at any locations.

1.5.3 All temporary fiber optic cables shall be run using temporary raceways (spiral wrap, split harness protective sheathing, etc., will be acceptable for this application). Cables shall not be run over auxiliary bars, ladder tracks, light fixtures, threaded rods, etc.

2. CABLING REQUIREMENTS

2.1. Common Items

2.1.1 When installing switchboard cable, the Installation Supplier shall tape both ends, unless the cable is being fed off of a cable reel. In this case, the loose end shall be taped. The Installation Supplier shall not allow the end to protrude into the equipment.

2.1.2 When Multiple Conductor 734C coaxial cable is placed within the upright spacing of the unequal flange equipment bay, the outer jacket sheath of the cable shall be removed as close to the top of the bay as possible in order to minimize the additional cable congestion caused by this sheath. The individual 734C cable members do not require any sheet fiber protection and may be secured, in a bundle, directly with waxed twine.

2.1.3 Cable shall be formed and dressed so as not to allow cables to protrude out past the footprint of the bay.

2.1.4 Installed cables, hanging unterminated in equipment areas, shall be neatly coiled above the floor level and have their exposed ends insulated.

2.1.5 Cable and wire shall be installed neatly within the stringers of the cable rack.

2.1.6 P-wire and switchboard cable shall not be installed on dedicated power cable racks unless directly associated with power circuits.

2.1.7 The Installation Supplier shall remove all cable tags before job completion, except tags designated “future” or tags left as directed by the AT&T LEC Equipment Engineer.

2.1.8 Ribbon cable shall not be installed on cable rack. Panduit type plastic trough (or equivalent) shall be provided for interbay installation.

2.1.9 Cable entering equipment frames shall enter the framework in a manner that will not block access of future cable.

2.1.10 Cables within an equipment unit (i.e.; switch, etc.) shall meet the manufacturer’s requirements and may be non-tinned if so designated by the manufacturer.

2.1.11 Shop cabling requirements within the “foot print of the equipment” shall be as defined by the manufacturer. If these requirements conflict with the requirements given in ATT-TP-76300, the manufacturer’s requirements shall apply.

2.1.12 Exposed ends of power cables shall be insulated with heat shrink caps.

2.1.13 Exposed ends of grounding cables shall be insulated with electrical tape or heat shrink caps during installation.

2.1.14 When transitional devices (H-taps, barrel taps) are installed on grounding and power cables, they shall be placed between cable rack straps.

2.1.15 Cables shall not be installed on blocked cable racks or runs.

2.1.16 All cable butts on coaxial and switchboard type cable shall be taped or have heat shrink placed around the butt. The tape and heat shrink shall be placed a minimum of 1 inch above and below the butt."

2.2. Cable Protection

2.2.1 When installing cable, the Installation Supplier shall provide adequate protection to prevent damaging new and existing cable.

2.2.2 When cable and wire come in contact with sharp metal edges, the Installation Supplier shall use formed fiber or two layers of sheet fiber to protect against damage at the point of contact.

2.2.3 The Installation Supplier shall protect all cable at break-offs when attached directly to the cable rack stringers with formed fiber or two layers of sheet fiber.

2.2.4 Cable rack straps shall be protected with formed fiber or two layers of sheet fiber for power cable dropping through the cable rack.

2.2.5 When rubber, neoprene and other non-textile jacketed power cable are secured, 2 wraps of insulating fiber protection shall be applied to the cable sheath at each secured or banded location. This requirement does not apply to power wire or cable within a bay.

2.2.6 Fiber protection shall be placed on the cable rack cross straps at outside bends or offsets in cable racks.

2.2.7 Cable shall be protected with fiber at points of contact with the flange side of cable rack cross straps. This condition may be encountered where inverted cable racks are used, or where cable must be placed on the flange side of cable racks.

2.2.8 Individual 735C type cables (see Table J-4 or J-5) shall be protected where they are to be secured or banded. This protection shall be accomplished by the use of two layers of sheet fiber or one layer of outer sheathing from multiple coaxial cables (i.e., six-pack or twelve-pack). Coaxial cables within a multiple cable package (i.e., six-pack or twelve-pack) and individual 734C type cables do not require this additional protection, since the outer sheathing of the package provides sufficient protection.

2.2.9 Under no circumstances shall the securing stitch or nylon cable ties be pulled so tightly as to deform the cable sheathing.

2.3. Damaged Cables

2.3.1 Damaged cable sheathing shall be repaired with electrical tape. The tape shall be applied in two half lapped layers with the final two wraps applied without tension and over lapping. The tape shall extend a minimum of 2 inches past the damaged section in both directions.

2.3.2 Seriously damaged sections of cable sheathing shall be repaired by removing the damaged section and replacing it with the covering from a similar cable. Apply a single half lapped layer of electrical tape over the new section to secure it in place.

2.3.3 Damaged power cable sheathing shall be repaired by wrapping with a minimum of two half lapped layers of rubber tape then two half lapped layers of electrical tape. The rubber and electrical tape shall extend a minimum of 2 inches past the damaged section in both directions.

2.3.4 A run of cable shall be replaced if the number of damaged or spliced conductors exceeds 5% of total conductors.

2.4. Securing Cable

2.4.1 Cables and wires on horizontal cable racks shall be secured with 9 ply polyester twine at the first and last strap, and at intervals not to exceed 3 feet. See Table J-4.

2.4.2 Chicago or Kansas City stitches shall be used when securing cable with 9 ply polyester twine. See Figures J-3 through J-6.

2.4.3 Cable installed on horizontal ladder type cable racks shall be sewn at break-off.

2.4.4 On vertical and inverted horizontal cable racks, cables shall be secured at every strap. See Table J-5.

2.4.5 All cables shall be dressed to avoid congestion and to permit accessibility to equipment.

2.4.6 All cables and wires shall be secured at the first support of frame or bay with 9 ply polyester twine.

2.4.7 All cables shall be secured with 9 ply polyester twine or nylon cable ties at the butt location of the cable. If the butt is not within 1 inch of the cable bracket, it shall be banded to the existing cables in the form.

2.4.8 When the cable butt is located below the lowest cable bracket in an equipment frame or bay, the length between the butt and the last bracket shall be no more than 10 inches.

2.4.9 The cables shall be secured at all cable brackets provided with the manufacturer's equipment. The cables at these intermediate brackets may be secured with 9 ply polyester twine or nylon cable ties.

2.4.10 If cable is terminated at a point above the top bracket in the bay, the cable shall be banded to the other cables at the point of break off, at the top of the bay or an L-type securing bracket.

2.4.11 Cable and wire shall be banded halfway between the cable rack and top support on the frame or bay when distances exceed 3 feet.

2.4.12 On cable rack with horns and pans the cable and wire shall be sewn only at break-off.

2.4.13 P-wire on panned cable racks shall be banded with 2 strands of twine every 5 to 6 feet to prevent curling or drooping.

2.4.14 P-wire on panned cable racks shall be banded at points where the wire changes direction.

2.4.15 Cables on ladder type cable racks having retaining brackets used to separate high and low level transmission leads in carrier systems, shall not be sewn, except at turn-off points.

2.4.16 Excess 9-ply polyester twine shall be trimmed to a maximum length of 1/2 inch.

2.4.17 The Installation Supplier shall secure cables to the cable securing brackets, if provided, at the rear of the shelf every two inches. This is required for cables transversing across the back of the shelf.

2.4.18 The installation supplier shall secure cables as shown in Tables J-2 through J-5.

2.5. Distributing Frame

2.5.1 On distributing frames (vertical side) having transverse arms on 13-inch vertical centers, cable shall be secured at all transverse arms.

2.5.2 On distributing frames (vertical side) having transverse arms on less than 13-inch vertical centers, cable shall be secured at the first (top or bottom) transverse arm where cable enters the frame and at alternate arms, counting from the first arm. Also secure the cables which butt or turn-off at the arm before the butt or turn-off.

2.5.3 On distributing frames (vertical side) the cable shall be butted 1/2 inch below the transverse arm and place the cable butt in the fanning ring. If fanning rings are not used, secure the cable butt with cord. The cable sheath shall be left in place to within 2 inches of the connecting block. Where this is not practical, exposed wire from the cable shall be wrapped with tape or stitched with 9 cord on 2 inch intervals to within 2 inches of connecting block and neatly dressed.

2.5.4 On distributing frames (horizontal side) cable and wire shall be secured at three places on the transverse arm: near the stiffening bar, at the center and near the butt location. On transverse arms 12 inches or less in length, cable shall be secured at two places.

2.5.5 On distributing frames (horizontal side) the cable shall be butted 2 inches from the rear of the terminal strip. Place in a fanning ring and secure the cable butt with cord.

2.5.6 On distributing frames (horizontal side), fanning rings are not required when connectorized cable is installed.

2.5.7 Cables transitioning from the vertical to the horizontal side of the distributing frame shall break off at the transverse arm directly above the transverse arm the cable is to be terminated

2.6. Formed Cable

2.6.1 Formed cable shall be secured at a level that affords access to the equipment.

2.6.2 Wiring added to existing formed cable shall be secured at 2-inch intervals.

2.7. Nylon Cable Ties

2.7.1 Nylon cable ties can be used in place of 9 ply waxed polyester twine except as specified below.

2.7.2 Nylon cable ties may be used for temporary securing during the job. Upon completion of installation, nylon cable ties SHALL NOT be used for:

a) Securing cables to distributing frames

b) Banding or securing cable on cable racks

c) Banding together of cable installed in compartmentalized troughs/racks.

d) Banding or securing of coaxial cables

e) Banding or securing fiber optic jumpers

f) Securing cable to the top cable securing bracket on equipment frames

g) Securing battery and battery return cables at any location.

2.7.3 Nylon cable ties shall be of an adequate size, type, strength, etc. for the particular application.

2.7.4 Except where reusable nylon cable ties are provided by the manufacturer, tails of nylon cable ties shall be trimmed to within 1/32 of an inch.

2.7.5 The Installation Supplier shall use a tool specifically designed for tensioning and cutting of nylon cable ties. Side cutters or equivalent shall not be used.

2.7.6 Nylon cable ties shall be tensioned around cable or wire forms tightly enough to hold the cables or wire together and/or properly positioned, but not so tightly or at such angles so as to cause possible damage to the insulation of the cable or wire.

2.7.7 Nylon cable ties, banded around cables or wire, shall be capable of being rotated with slight to moderate pressure applied with the thumb to the head of the tie. If banded cables or wire, under and/or adjacent to the nylon cable tie, twist or deform when pressure is applied to the head of the tie, then the tie has been applied to tightly.

2.7.8 Under no circumstances shall nylon cable ties have sharp or jagged cut ends protruding from the locking head. A nylon cable tie is considered to have sharp or jagged ends when it is sharp to the touch.

2.7.9 The locking head of nylon cable ties shall be positioned so as not to interfere with the installation or removal of apparatus or equipment.

2.7.10 When cables/wire are added to a bundle secured with nylon cable ties, the existing tie shall be removed and the entire bundle secured with a new tie or 9-ply polyester twine. This requirement does not apply to firestopping banding requirements (see Section F).

2.7.11 Where cable or wire forms are secured to cable securing brackets, the locking head of nylon cable ties shall be positioned on the side of the bracket opposite the side on which the cables or wire are installed.

2.7.12 Adhesive-backed tie wrap bases that rely only on the adhesive backing to attach to walls, columns, equipment, auxiliary framing, etc., shall not be used to secure cable or wire outside the confines of a frame.

2.8. Bending Radius

2.8.1 Cables shall not be sharply bent or twisted during a forming operation.

2.8.2 The minimum inside bending radius of switchboard, shielded and twin conductor cable is 5 times the cable diameter.

2.8.3 The minimum inside bending radius of non-bundled coaxial cable and bundled 734 type coaxial cable is 7 times the cable/bundle diameter.

2.8.4 The minimum inside bending radius of bundled coax (735 type) cable is 10 times the bundle diameter.

2.8.5 The minimum inside bending radius of power wire and cable is 7 times the cable diameter.

2.8.6 The minimum inside bending radius of fiber optic cable, jumpers or patch cords is 1.5 – inch radius or 20 times the cable diameter, whatever is larger..

2.8.7 The minimum inside bending radius of Jacketed Metallic Clad (JMC) cable is five times the diameter of the cable measured on the inner side of the bend.

2.8.8 CO grounding system conductors shall be installed with a minimum radius of one foot. If the one foot radius objective can not be met, a smaller radius is acceptable based on the following conditions:

a) For the #2 AWG peripheral conductor at a radio site the minimum bend radius shall be 6 inches.

b) For all other conductors, the minimum bend radius shall not be less than 5 times the finished diameter of the cable. Table J-7 provides the minimum bending radius, rounded up to the nearest inch, for the most common grounding conductor sizes based on the approximate diameter for rubber-covered wire (type, RHH, RHW).

3. POWER CABLING

3.1. General

3.1.1 Where possible, the Installation Supplier shall install all leads in continuous lengths from the power source to the equipment termination. Where the size of the cable is too large for the termination connection, in-line reduction-taps are the preferred method to terminate the cable.

3.1.2 Exposed ends of power cables, while being installed, or transitioned, shall be insulated with an electrical tape secured heat shrink cap or a heat shrink cap that has been heat shrunk onto the end of the cable(s).

3.1.3 The secondary battery and battery return leads are a pair and shall be installed closely coupled.

3.1.4 The secondary battery and battery return leads shall be installed on existing dedicated secondary power cable racks whenever possible.

3.1.5 For special synchronization power requirements, see Section T of ATT-TP-76300.

3.1.6 When connecting battery return cables to the return bus bar in BDFBs/SPDUs, the Installation Supplier shall terminate the cables in such a manner as to allow future access for cable connections to the bus bar.

3.1.7 When connecting to BDFB/SPDU fuse position studs, the Installation Supplier shall arrange cable in such a manner so as to not block access of future terminations.

3.1.8 AC cable shall be fully protected via conduit or trough to meet NEC code and local municipality requirements.

3.2. Sewing And Securing

3.2.1 Power cable leaving cable racks, supports, and entering frames, racks or other equipment shall be supported at least every 3 feet.

3.2.2 The Installation Supplier shall comply with Table J-2 and Table J-3 for sewing power cable to the cable racks. The requirements apply to uniform size leads.

3.2.3 Power cable shall be secured on unpanned cable rack immediately before and after turns and changes in elevation.

3.2.4 Power cables on unpanned racking shall be secured at every strap or flat bar at every turn.

3.2.5 For vertical power cable runs, the Installation Supplier shall install one power cable clamp per floor where three or more floors are involved. No clamps are required when power cable runs are one or two floors.

3.2.6 The Installation Supplier shall insulate the cables from the clamping bar by using an angle type insulator or by wrapping the cables with two (2) wraps of insulating fiber at the clamp.

3.2.7 Power cables terminations shall be supported and/or secured in such a manner as to prevent stress on the connection.

3.3. DC Power Cable Routing

3.3.1 Unfused battery conductors and their accompanying battery return leads, such as those between the batteries and power boards, shall not be run on panned racks.

3.3.2 Unfused battery conductors and their accompanying battery return leads, such as those between the batteries and power boards, shall not be run with other conductors.

3.3.3 Primary battery and battery return leads shall be run on unpanned dedicated power cable rack.

3.3.4 Unless authorized by the AT&T LEC Equipment Engineer, power cable within the primary distribution system (within the power plant or between the power plant and the first point of distribution) shall not be run on cable racks equipped with cable retaining brackets or horns.

3.3.5 The battery and battery return leads are a pair and shall be run closely coupled.

3.3.6 The BDFB/SPDU battery conductor need not be paired with the battery return conductor for the portion of the run to and from the MGB if a significant amount of additional cable for the battery conductor is required to maintain pairing. See Figure J-2 (b) and (c). The return conductor shall be closely coupled (to itself) along the route to and from the point where it leaves the route of the battery conductor and the connection to the MGB. Where significant conductor length is not a factor, the battery and battery return conductors shall remain paired. See Figure J-2 (a).

Note: When the battery return conductor is longer than the battery conductor, the size of the battery return conductor shall be adjusted, if necessary, to meet any voltage drop requirements.

3.3.7 The battery return conductors of a circuit serving common bonding network equipment may be connected directly to the Common Bond Network (CBN) side MGB as in Figure J-2 (b) or, to save space on the MGB, they may be bonded to the MGB with a conductor not exceeding 3 feet in length. This is shown in Figure J-2 (a) and (c).

Note 1: One bonding conductor may be serially connected, using crimp type parallel connectors (H-Tap), to more than one battery return conductor, provided the bonding conductor is no longer than 3 feet.

Note 2: The bonding conductor shall be the same size as the battery return conductor for sizes up to #1/0 AWG. Larger conductors may be bonded using a #1/0 AWG.

3.3.8 BDFBs/SPDUs are used to distribute one or more DC voltages to network equipment. The battery return bus bars on early BDFBs were in electrical contact with the framework of the BDFBs. All new BDFBs/SPDUs shall have the return bus bar insulated from the framework.

3.3.9 Secondary power feeds shall not be installed on the dedicated primary power cable rack.

3.3.10 The secondary battery and battery return leads are a pair and shall be installed closely coupled except when being referenced to the Ground Window.

3.3.11 Secondary power feeds that are installed on panned cable racking shall be banded every six feet.

3.3.12 When connecting battery return cables to the return bus bar in BDFBs/SPDUs, Power Boards (PBDs etc.), the Installation Supplier shall terminate the cables in such a manner as to allow future access for cable connections to the bus bar.

3.4. AC Cable Routing

3.4.1 Metallic Armored Clad (MAC) and BX cable shall be replaced with Jacketed Metallic Clad (JMC) cable or conduit whenever AC circuits are rearranged, except within bay end guards and AC outlet extensions within the base of the bay.

a) All final AC equipment connections, or conduit transitions from walls or columns in Seismic Zones 3 & 4, with Jacketed Metallic Clad (JMC) flex (Seal-Tite® or Liquidtight® rated UL 94 V-0) shall not exceed three feet (including 6" of slack).
b) All final AC lighting fixture connections with Jacketed Metallic Clad (JMC) flex (Seal-Tite® or Liquidtight® rated UL 94 V-0) shall not exceed six feet.
c) Jacketed Metallic Clad (JMC) flex (Seal-Tite® or Liquidtight® rated UL 94 V-0) may be run a distance greater than three feet only within bay end guards and bases to connect light switches and bay test receptacles. The JMC shall not have excessive slack or be coiled within the bay end guard or base.

3.4.2 JMC cable shall be placed on a separate pathway segregated from DC power cables and switchboard cable, or secured to cable rack stringer, auxiliary framing or cable brackets over equipment areas.

3.4.3 AC armored cable shall never be placed on cable racks containing any other type of cable.

3.4.4 AC power cable placed in metallic conduit, flexible raceways or JMC shall not be run through cable hole penetrations containing switchboard or DC power cables.

4. CABLE RACK LOADING

4.1. Blocked Cable Runs

4.1.1 When blocked cable runs in cable racks or cable penetrations are encountered, the Installation Supplier shall contact the detail engineer for instructions.

4.1.2 A cable hole shall not be filled beyond 75 percent of its capacity, and cables shall not be placed closer than 3 inches from edges.

4.1.3 When a cable hole reaches capacity no more cable shall be run through the cable hole and the floor plan shall be marked to reflect blocked conditions.

4.1.4 The Installation Supplier shall report a blocked cable hole to the AT&T LEC Engineer and the AT&T Space Planner, fill out a JIM reporting the blocked condition and place a copy of the JIM in the yellow wallet.

4.2. Cable Pileup

4.2.1 Installation Suppliers shall immediately notify the AT&T LEC equipment engineer when 75 percent of the cable pileup capacity of a cable rack or a portion of a cable rack has been reached. See Table J-6.

4.2.2 Cables run on panned racking equipped with cable horns shall not exceed the height of the cable horn or the requirements that are stated in Table J-6, whichever is less. Cable rack horn extensions shall not be installed.

5. GROUNDING SYSTEM CONDUCTORS

5.1.1 All grounding system conductors shall be routed on and secured to:

a) A cable rack or cable bracket containing only grounding conductors

b) The side or bottom of ironwork details or cable rack containing other cable types

c) The surface of ceilings, columns, or permanent walls.

Note 1: Grounding conductors may be placed on the same cable brackets used to support other cables if the grounding conductors are secured to the surface of the bracket opposite that used to secure the other cables.

Note 2: Some equipment manufacturers allow grounding conductors routed within their equipment systems to be routed with other conductors, typically dc power conductors. When a system is approved for use, the routing requirements of the equipment vendor may apply.

5.1.2 When grounding conductors are routed on the side or bottom of cable racks or other ironwork or surface of ceilings, columns or walls, the conductors shall be secured at an intervals of 11 to 12 inches. When cable brackets are used for support, they shall be placed at an interval of 18 to 20 inches.

5.1.3 When a horizontally run grounding conductor is placed on or under a cable bracket or other support detail, the conductor shall be secured to each bracket or support detail using nylon cable ties or 9-ply waxed polyester twine. (See Figure J-1): In addition:

a) Grounding conductors up to and including #1/0 AWG may be secured to the sides of cable rack stringers, auxiliary framing bars, threaded rods and other ironwork details with nylon cable ties or 9-ply waxed polyester twine.

b) Grounding conductors larger than #1/0 AWG shall be secured to the sides of cable rack stringers, auxiliary framing bars, threaded rods and other ironwork details with 9-ply waxed polyester twine.

5.1.4 Grounding conductors secured to the underside of cable racks shall be secured to alternate cross straps with 9-ply waxed polyester twine.

5.1.5 The exterior surface of conduits or raceways containing AC power conductors shall not be used to support grounding system conductors.

5.1.6 Several methods of supporting grounding conductors, including vertical and horizontal equalizers, and typical material are shown in ED-97729-11, *Protective Grounding Systems for Central Office Equipment*. The use of support methods similar to those shown in this drawing is acceptable.

5.1.7 Unless expressly required by local code, CO grounding system conductors (other than ACEG conductors) shall not be run in metallic conduit. If a CO grounding system conductor is placed in metallic conduit, raceway or sleeve more than three feet in length, it shall be bonded to the conduit, raceway or sleeve at each end with a minimum #6 AWG conductor.

5.1.8 When metal clamps are used to support or secure CO grounding conductors, the clamps shall not completely encircle the conductor. The metallic continuity shall be interrupted by non-metallic hardware, a cable tie or 9-ply waxed polyester twine. The phrase *completely encircle* applies primarily to ferrous metal cable clamps. It does not apply to an opening or "ring" formed by a combination of interconnected metallic objects such as cable racks, auxiliary framing, threaded rods, etc., unless the length (l) of this opening is more than 3 times its diameter (D). Examples of openings that do not create complete encirclement of a grounding conductor are:

c) Where the conductor is routed through a metal cable hole cover instead of a floor sleeve (l is typically < ¼", D is typically > 1 ½")

d) Where the conductor is on a cable rack and passes through the opening formed by the cable rack's stringers and straps (l is typically <3", D is typically > 18")

e) Where the conductor passes through as interior wall constructed with sheet metal studs (l is typically < 8", D is typically > 48")

f) Arrangements similar to (a) through (c) above.

5.1.9 The DC Electrical Ground (DCEG) conductor for BDFBs/SPDUs shall be a minimum #1/0 AWG conductor, and shall be connected directly to a CO GRD bus bar or tapped to a horizontal equalizer of equal or greater size.

TABLE J-1 – SUMMARY OF CHANGES IN SECTION J

Change	Item in 11/1/05 Issue	Item in this Issue
Revised	2.5.3 3.4.1 a) 3.4.1 b) 3.4.1 c)	2.5.3 3.4.1 a) 3.4.1 b) 3.4.1 c)
Deleted		
Added		

TABLE J-2--HORIZONTAL RESTING RUNS (POWER)				
Size of Copper Cable	**Sew at Strap**	**Number of Cord Strands**	**Ultimate Number of layer**	**Cable Per Stitch**
400 MCM-750 MCM	alternate	4	any number	2
No. 1/0-350 MCM	alternate	2	any number	2
No. 6-1	every	2	any number	4
No. 14-8	every	2	any number	any number bundled

TABLE J-3--VERTICAL RUNS AND/OR INVERTED HORIZONTAL RUNS (POWER)				
Size of Copper Cable	**Sew at Strap**	**Number of Cord Strands**	**Ultimate Number of layer**	**Cable Per Stitch**
300 MCM-750 MCM	every	4	any number	1
No. 1/0-4/0	every	4	any number	1
No. 6-1	every	2	any number	2
No. 14-8	every	2	any number	1 inch diameter bundle max

TABLE J-4--HORIZONTAL RESTING RUNS (SWITCHBOARD AND COAXIAL)				
Diameter of Cable	**Type**	**Sew at Strap**	**Number of Cord Strands**	**Cable Per Stitch**
Up to 1/2”	round	every fourth	2	6
over 1/2” to 3/4”	round	every fourth	2	5
over 3/4” to 1”	round	every fourth	2	3
over 1”	round	every fourth	2	2
(735 type)	mini-coax	every fourth	2	16
(734 type)	coax	every fourth	2	8

TABLE J-5--VERTICAL RUNS AND/OR INVERTED HORIZONTAL RUNS (SWITCHBOARD AND COAXIAL)

Diameter of Cable	Type	Sew at Strap	Number of Cord Strands	Cable Per Stitch
Up to 1/2”	round	every	2	5
over 1/2” to 3/4”	round	every	2	2
over 3/4”	round	every	2	1
(735 type)	mini-coax	every	2	16
(734 type)	coax	every	2	8

TABLE J-6--CABLE CAPACITY OF STANDARD CABLE RACKS (5'-0" Support Spacing)

Rack Width	Normal Capacity				75% Rule Capacity			
	Capacity (In.^{2})		Pileup (inches)		Capacity (In.^{2})		Pileup (Inches)	
	Sec.	**Unsec.**	Sec.	Unsec.	Sec.	**Unsec.**	Sec.	Unsec.
1'-0"	132	**132**	12	12	99	**99**	9	9
1'-3"	168	**210**	12	15	126	**157**	9	11
1'-8"	228	**285**	12	15	171	**213**	9	11
2'-1"	288	**360**	12	15	216	**270**	9	11

Note (1) In.^{2} capacity is based on the rack width minus 1" for stringer attachment hardware.

Note (2) According to the above a new switch or other equipment entity having 500 In.^{2} of **secured** interconnecting cable to other network elements requires a minimum of three 1'-8" via cable rack paths (500/171 = 2.9 racks @ 75% capacity).

TABLE J-7 – MINIMUM BENDING RADIUS FOR GROUNDING CONDUCTORS

Grounding Conductor Size	Minimum Bending Radius (inches)
6 AWG	2
4 AWG	3
2 AWG	3
1/0 AWG	4
4/0 AWG	4
750 kcmil	7

FIGURE J-1 - USE OF CABLE TIES TO SECURE GROUNDING CONDUCTORS

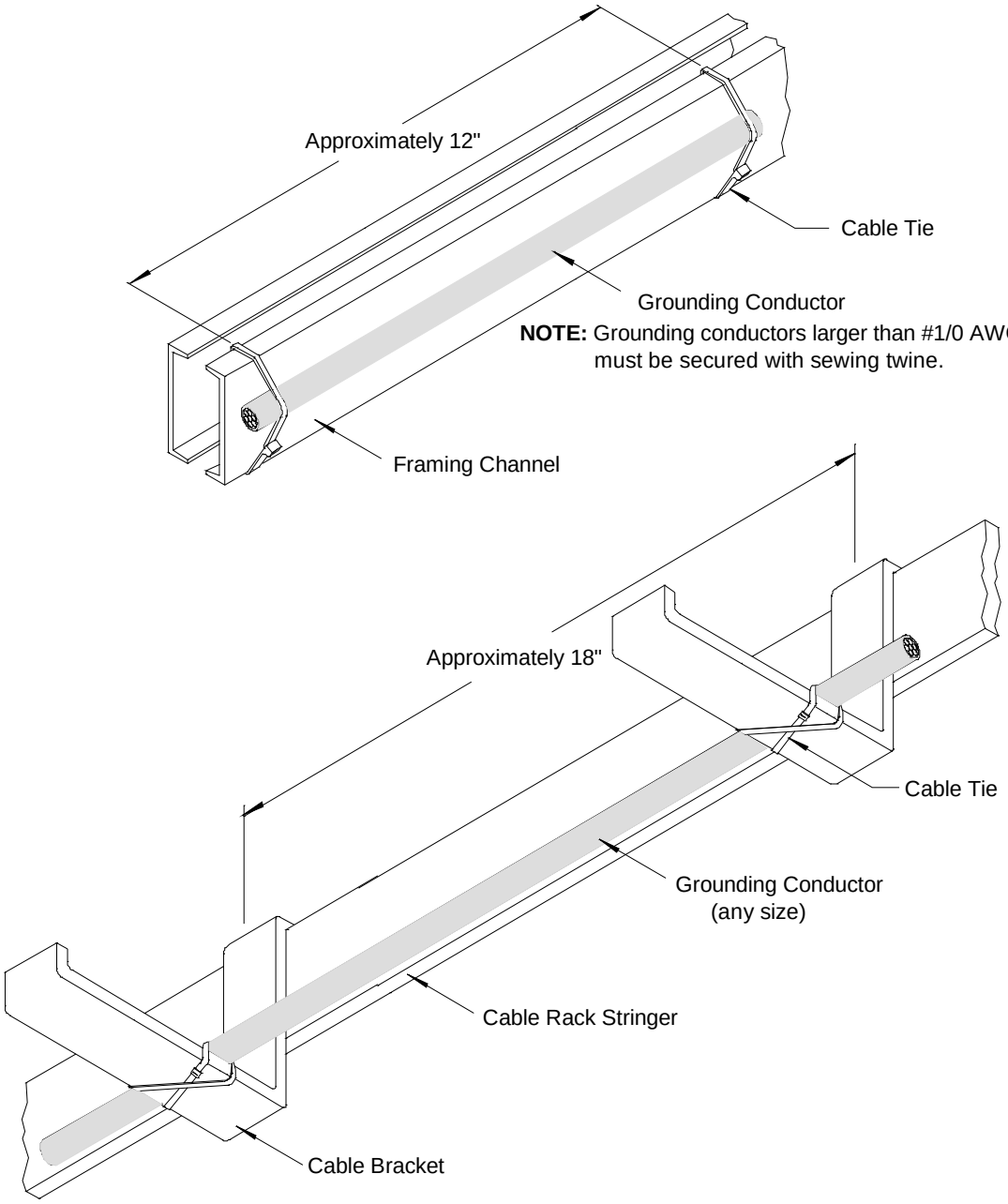


Figure J-2 Bonding of Battery Return Conductors of Shared Power Plant to the MGB

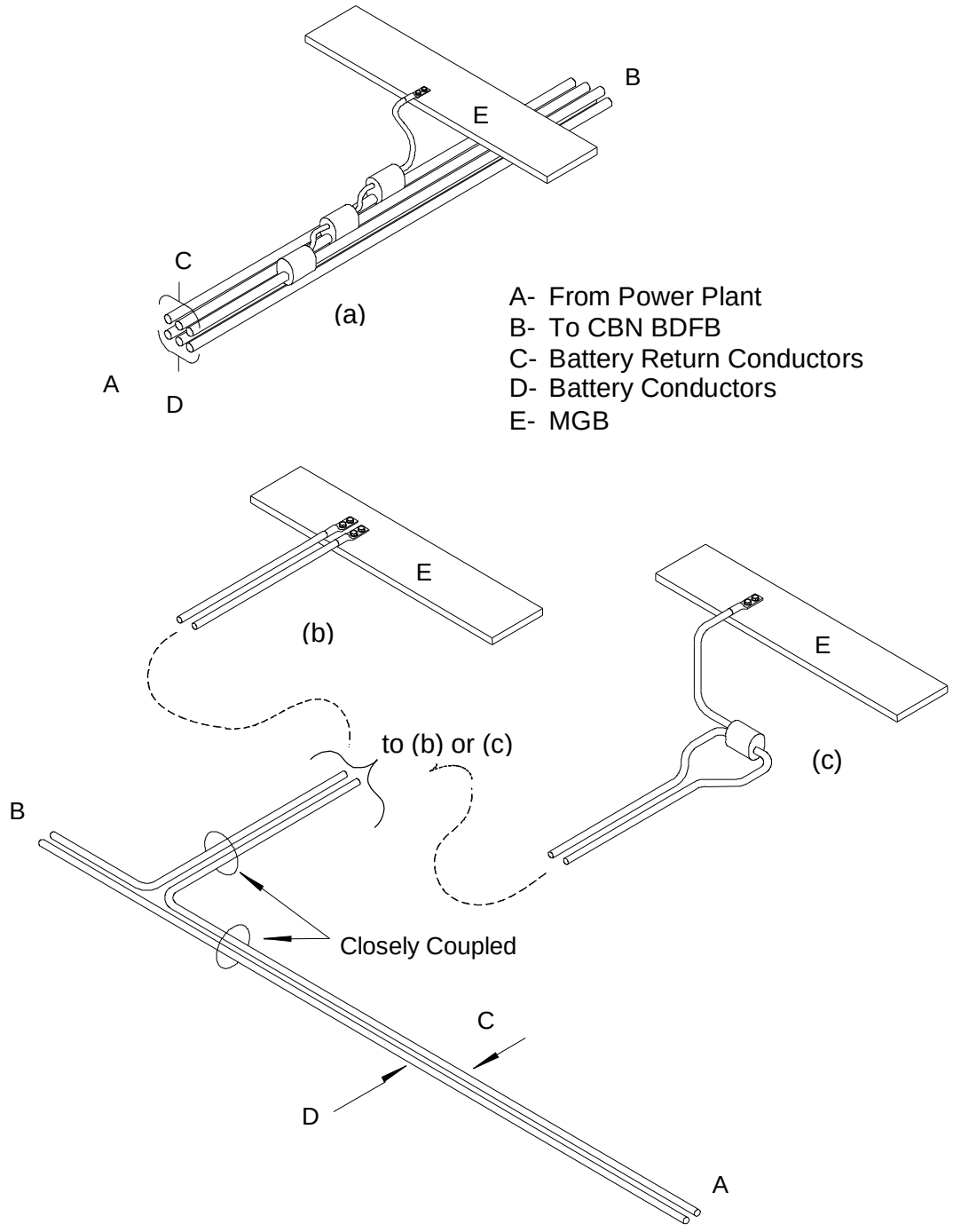


Figure J-3 Kansas City Stitch

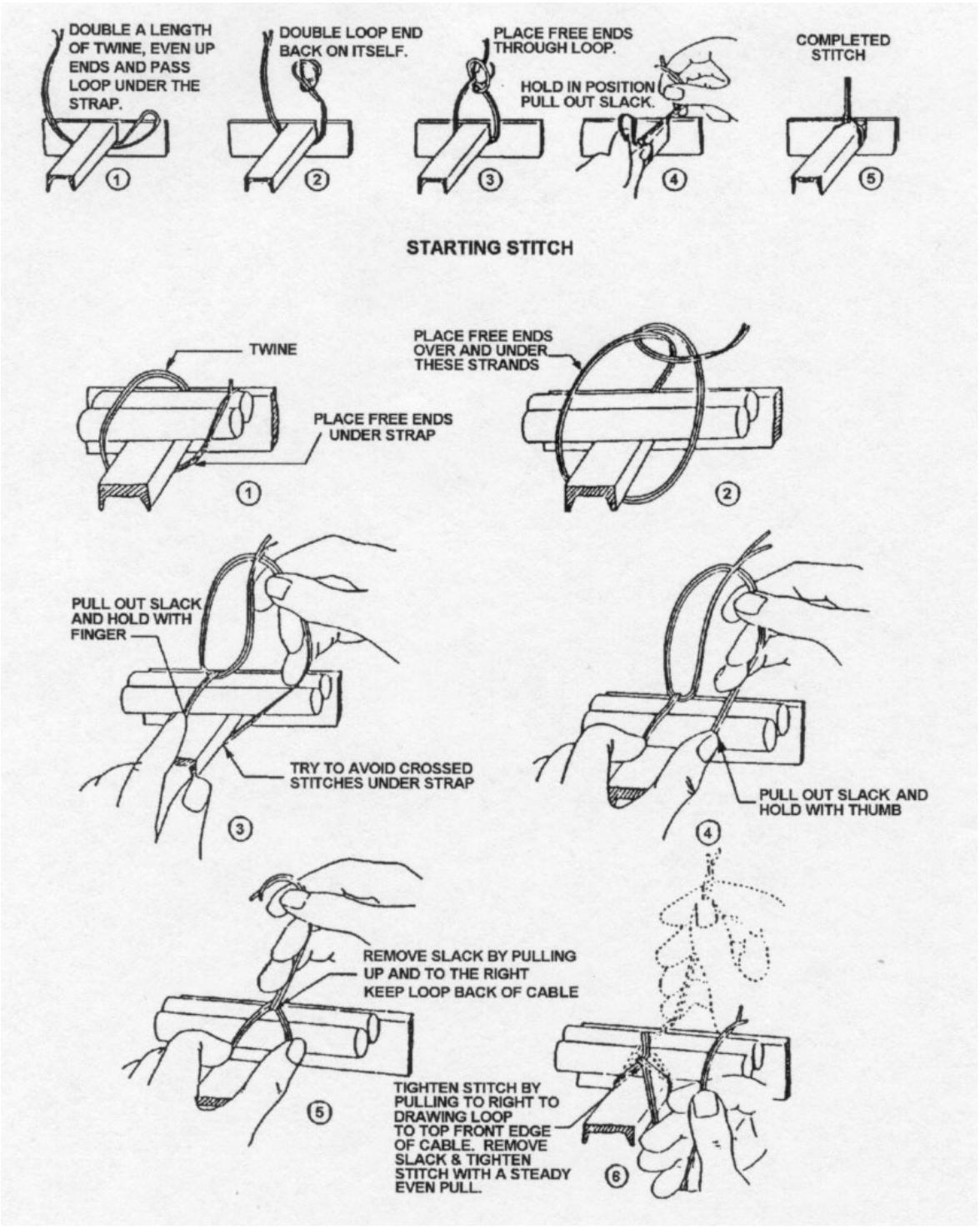


Figure J-4 Ending Stitches

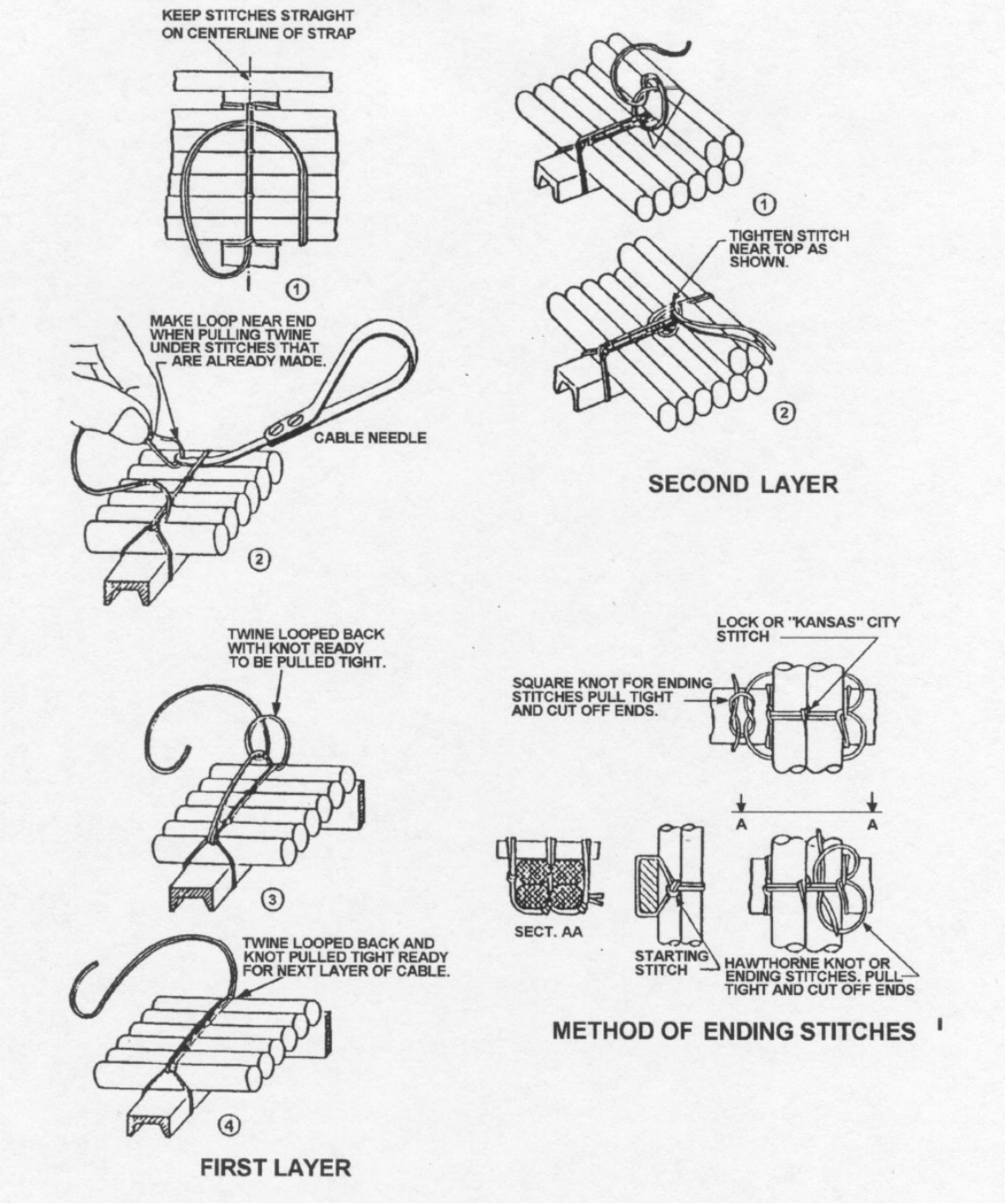


Figure J-5 Sewing Cable to Supports at Turns (Chicago Stitch)

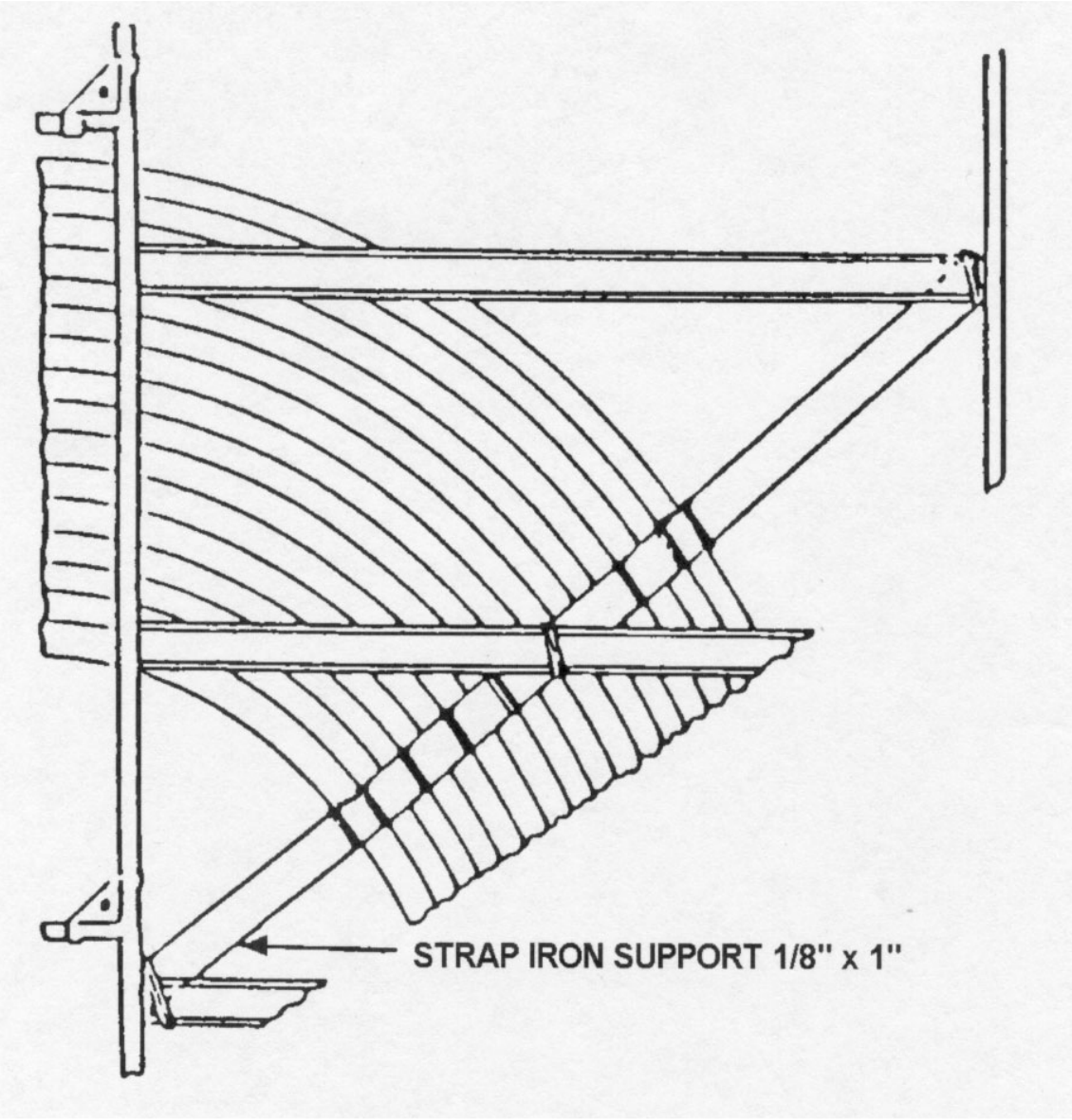


Figure J-6 Cables From Miscellaneous Run Secured Together Between Rack and First Support with a Modified Chicago Stitch

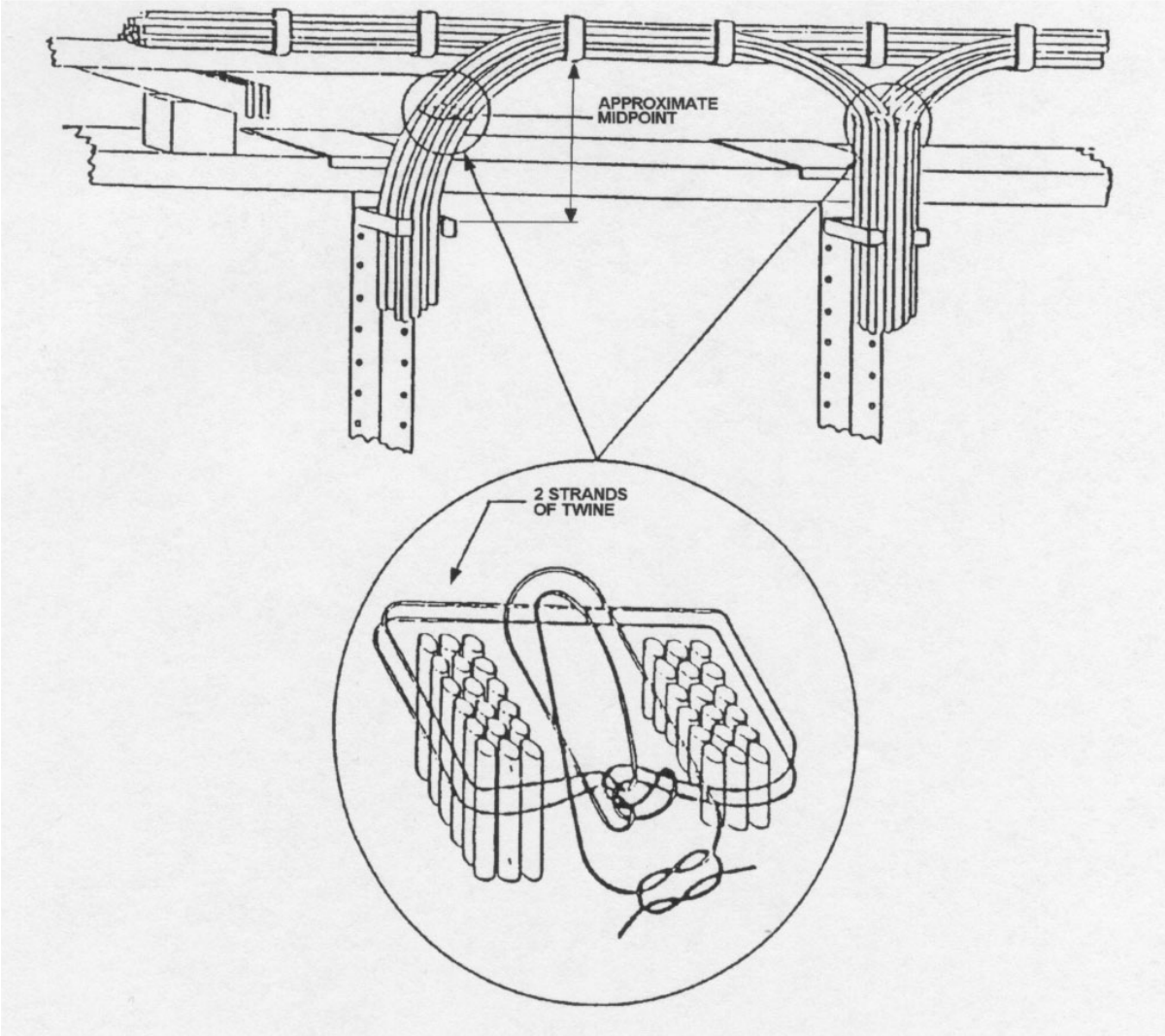
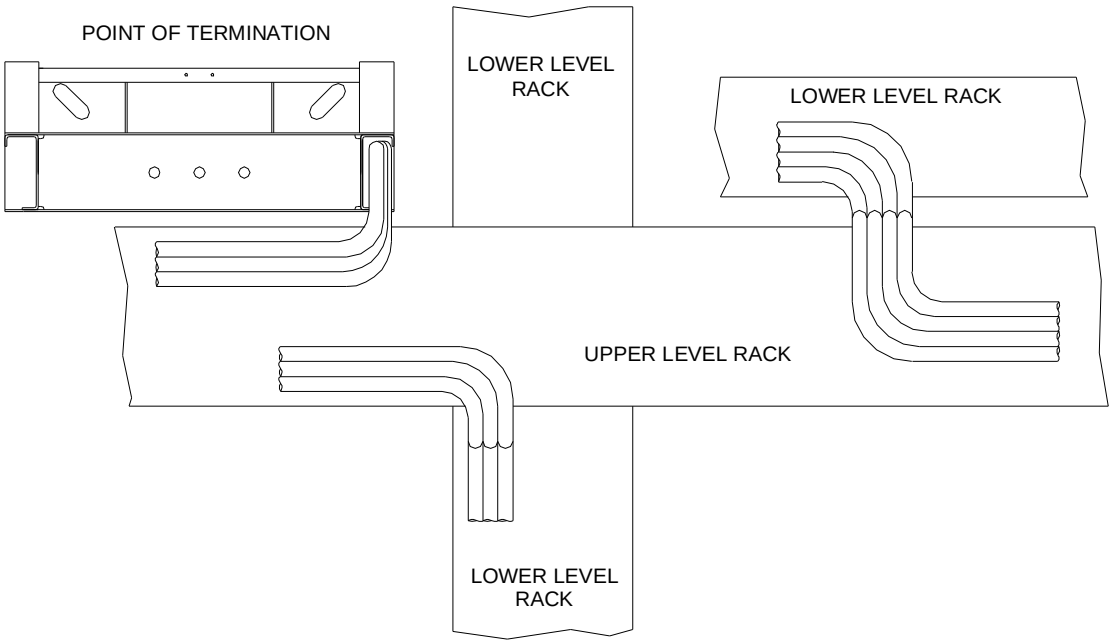


Figure J-7 Cable Routing Restrictions for Racks Installed At Different Levels



CABLE SHALL EXIT/WATERFALL OFF THE SIDES OF CABLE RACK AT POINTS OF TERMINATION ONLY.

EXCEPT FOR ATT-TP-76409 FIG. 6(F) ARRANGEMENT, CABLE SHALL NOT BE ROUTED BETWEEN VERTICALLY OFFSET RACKS AT CABLE RACK INTERSECTIONS OR ALONG THE LENGTHS OF PARALLEL CABLE RACKS THAT ARE AT DIFFERENT LEVELS.

[END OF SECTION]

SECTION K -- WIRING AND CONNECTING

CONTENTS PAGE

1. GENERAL

1.1. Introduction

1.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all equipment added, rearranged or modified is properly installed and in conformance with AT&T LEC installation specifications.

1.1.2 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

1.1.3 This section covers the requirements for wiring, fanning and forming switchboard cable, treatment of loose wires and the requirements for soldered, coaxial, ABAM, compression/crimp type, quick connect and solderless wrapped connections.

1.1.4 Changes in this issue of Section K are summarized in Table K-1.

2. GENERAL REQUIREMENTS

2.1. General

2.1.1 Unterminated ends of switchboard cable (not connectorized) shall be protected with electrical tape and stored to prevent incursion into working equipment.

2.2. Connecting

2.2.1 Sufficient length shall remain in all wires after connecting operations are completed so that they may be reskinned and reconnected if necessary.

2.2.2 All connections shall be made to ensure proper electrical operation of equipment.

2.2.3 All connections shall be torqued to the manufacturer's specifications. If specifications are not available from the manufacturer, refer to ATT-P-05100-E drawing for NEMA torque information to be used.

2.2.4 Bus bar connections shall be marked to indicate that they have been tightened to recommended torque levels. The marking shall normally show on the bolt head, and carry through the washer and onto the connecting surface if visible for inspection; otherwise, the torque marking can be made on the nut, washer and onto the connecting surface, whichever is easiest to mark for visible inspection.

2.2.5 Any connector drilled with two fastening holes shall be secured using both holes.

2.3. Reused Equipment

2.3.1 Reused or relocated equipment that has wire wrap terminals which meet quality standards, but were soldered previously, shall be cleaned of solder so new solderless wire wrapped connections can be applied. Wires on these terminals will not require soldering if all other connecting requirements are met.

2.4. Mechanical Connections

2.4.1 For DC circuits, mechanical connections (thread pressure type) shall not be installed unless authorized by the AT&T LEC Equipment Engineer. If the original factory equipment has mechanical connections, the connections shall be tightened to the manufacturer's specifications.

2.4.2 Per the NEC, mechanical connections are allowable and approved for use for AC circuits.

3. SPECIFIC REQUIREMENTS

3.1. Wire and Cable

3.1.1 For DC applications, only AT&T LEC approved wire and cable shall be used as defined in the Minor Materials list, AT&T Drawings and Practices .

3.1.2 AC applications shall follow NEC and local jurisdictional requirements.

3.1.3 AC and DC wire and cable shall be dressed in such a manner as to:

a) avoid excessive strain and congestion

b) ensure accessibility for maintenance

c) allow for future applications

d) maintain clearance between terminals

e) and secured to wiring brackets, if provided

3.1.4 Spare and unused wire shall be left long enough to reach the ultimate circuits being served, then placed in a PVC tube or folded back and sewn to the existing form.

3.1.5 For AC wiring, the Installation Supplier shall use color-coded wiring in accordance with the NEC.

3.1.6 Tip and ring conductors shall be paired. Single leads and split pairs are not acceptable for tip and ring applications.

3.1.7 The normal twist of wires (such as tip and ring pairs) shall be left in place between the butt and connection point. Because of various equipment configurations, it may not always be practicable to keep the twist in place to the actual connection point. In these cases, the last twist in the wire shall be as close to the connection point as possible or at a point where one of the wires leaves the form.

3.1.8 P-wire shall not be spliced.

3.1.9 Splices shall not be made within conduits.

3.2. Distributing Frame

3.2.1 Fanning rings shall be placed on transverse arms that are equipped with a terminal strip. Fanning rings are not required when connectorized terminal strips are provided.

3.2.2 Loose wires not held in place by fanning rings shall be banded at each point of breakout with cord and protected with fiber.

3.3. Soldered Connections

3.3.1 Solder shall be rosin core, 60 percent tin and 40 percent lead (or an equivalent lead free solder) having a melting range of 360-370 degrees F.

3.3.2 Soldered connections shall have a smooth bright appearance with the wire fused to terminal and completely covered with solder. Connections shall be checked for cold solder joints.

3.3.3 A minimum of one and one quarter turns shall be made on all soldered wrapped connections.

3.3.4 Wires connected at perforated terminals shall be brought through the hole from below or from the left, bent against the terminal and away from the apparatus.

3.3.5 Wire terminals with holes, notches and semi-tubular terminals shall be filled with solder.

3.3.6 Wire ends shall be cut off a maximum 1/16 inch from the terminal.

3.3.7 Minimum clearances between soldered connections and adjacent metal work shall be 1/32 of an inch.

3.3.8 Minimum clearances between adjacent soldered connections shall be 1/64 of an inch.

3.3.9 Shiner length between insulation and point of contact with the terminal shall not exceed 1/8 of an inch.

3.4. Coaxial Cable and Connectors

3.4.1 Coaxial cable shall not be spliced.

3.4.2 Only approved coaxial cable and connectors shall be used.

3.4.3 Only approved coaxial cable connector crimping tools with registered dies shall be used. Coax crimps shall be embossed with the vendor ID.

3.4.4 When stripping individual 734C and 735C coaxial cables for use with Kings BNC type coaxial connectors, the Installation Supplier shall only use an AC powered cable stripping device.

3.4.5 Pin height and continuity (for open and shorts) shall be verified on every installed coaxial connector.

3.4.6 There shall be no cracks or evidence of double crimps on the outer sleeve.

3.4.7 The crimped outer sleeve shall exhibit six flat surfaces with no fins or excessive rounding at the 60-degree corner bends.

3.4.8 Coaxial cable leaving the rear of the BNC connector shall not be bent in such a manner as to cause kinking of the cable and shall not violate the established bending radius criteria.

3.4.9 The ferrule shall be butted against the connector body.

3.4.10 The braided shield shall not be exposed at either end of the ferrule.

3.4.11 The Installation Supplier shall ensure that all coaxial connectors are locked.

3.5. Shield Connection

3.5.1 The shields of shielded cables shall be cut, positioned and bonded to ground as specified in the job documentation.

3.5.2 Shielded cable and wire shall have the shield ground bonded at one end only. This bonding will be at the equipment (originating) end unless the product design specifies otherwise. Refer to Section T for requirements specific to synchronization.

3.5.3 Exposed shields of shielded cable shall be protected with two half-lapped layers of electrical tape or heat shrinkable sleeving.

3.5.4 On shielded switchboard cable, the drain lead shall be protected by applying sleeving material.

3.6. Quick-Connect (Punch Type Terminals)

3.6.1 Only one wire shall be engaged in each terminal.

3.6.2 Only solder sleeve type splicing connectors shall be used for splicing individual leads.

3.6.3 Conductors shall not be placed on deformed terminals.

3.6.4 Previously terminated wire ends shall not be re-terminated. Cut them off and use new ends.

3.6.5 Wire ends shall protrude 1/16 inch beyond edge of clipped terminal.

3.6.6 Wire ends shall clear adjacent metallic parts by 1/32 of an inch minimum.

3.6.7 Textile-insulated wire shall not be terminated in slotted beam terminals.

3.7. Solderless Wire Wrapped

3.7.1 Solderless wire wrapped connections on square terminals shall conform to Figures K-2 and K-3 unless the length of the pin on the backplane does not allow for the minimum number of wraps. Common defects are illustrated in Figure K-4.

3.7.2 Pigtail connections shall not exceed 3/32 of an inch. This distance is measured from the last contact of the bare portion of the wire with the terminal.

3.7.3 Wire wraps shall be made using the tool sized to the wire gauge.

3.7.4 On terminals that are not square, 26-gauge wire shall have a minimum of 8 turns.

3.7.5 Overlapped turns shall not be counted in the number of turns of a connection.

3.7.6 Wire of gauges 28, 30 or 32 shall have one wrap of insulation in addition to the required number of wraps.

3.7.7 All connections not meeting the requirements of Figure K-2 shall be reskinned and reconnected. Connections that cannot be rewrapped shall have a minimum of one and one half wraps for 20, 22, 24 gauge and wire shall be soldered except on equipment backplanes.

3.7.8 When solderless wrap terminals are used for cross connections, a defective wire connection shall not be soldered. The defective connection shall be removed and replaced by a satisfactory solderless wrapped connection.

3.7.9 The Installation Supplier shall not solder 26 through 32 gauge wire.

3.7.10 Exposed uninsulated wire (shiner) shall not exceed 1/8 inch.

3.7.11 Clearance between connections and adjacent metal work shall be 1/32 of an inch minimum. The wire end projection shall not violate the minimum clearance.

3.7.12 Clearances between adjacent connections shall be 1/64 of an inch minimum. The wire end projection shall not violate the minimum clearance. Wire wrap terminals on blocks, backplanes, etc. shall be straight and not bent.

3.7.13 When adding a second wire-wrap connection to a wire-wrap terminal that has a soldered connection, the Installation Supplier shall also solder the new connection.

3.7.14 The first connection on a terminal that will support multiple wire wraps shall be placed to the rear of the terminal to allow for future connections.

4. CONNECTORS

4.1. 710, 711 and Similar Type Connectors

4.1.1 Cable may be spliced using modular splicing apparatus. These splices shall be done in accordance with the manufacturer's specification. The AT&T LEC Equipment Engineer shall approve any use of these connectors.

4.1.2 The index strip shall have two wires in each slot.

4.1.3 Both halves of the connector body shall be fully latched. If not self-latching, or fitted with locking screws or securing clips, the two halves shall be secured on each end with 9-ply polyester twine, except when they need to remain readily available for rapid opening (e.g., for dial-to-dial conversion activity).

4.1.4 The cap shall be fully latched to the connector body and index strip.

4.1.5 When connectors are placed on cable racks or pressed into adjacent cables they shall be covered with heat shrink tubing.

4.1.6 Cables fitted with connectors, but not connected, shall be secured with waxed fiber cord so that the cables will not protrude into the wiring aisle behind the bay.

4.1.7 When modular splicing connectors are used on a modular (Cosmic) or a conventional type distributing frame, the connectors shall be spaced as to allow for cable growth, maintenance work, etc.

4.2. Connectorized Cables

4.2.1 The ends of connectorized cables shall be positively secured to the corresponding mate connector or backplane connector. In the event the screw, clip, or other interlocking device designed for the specific connector cannot be used, the male and female ends shall be secured with cord or tie wraps.

4.2.2 Connectorized cables (such as with Amphenol connectors) shall not be connected together in cable troughs or on cable racks.

4.2.3 Connectorized cables connected to the rear of units shall be secured with waxed fiber cord so that the cables will not protrude into the wiring aisle behind the bay.

4.3. Terminal Type Connectors (#10 Awg And Smaller)

4.3.1 Connections made to screw type terminals with #10 through #26 gauge tinned copper wire shall be made using the correct color coded insulated type terminal.

4.3.2 Only one terminal type connector shall be placed under a screw or bolt.

4.3.3 The proper size connector shall be used for the wire size being terminated, as detailed in the manufacturer's specifications.

4.3.4 Only one wire end shall be terminated in a terminal type connector (lug).

4.3.5 Terminal type connectors (lugs), except #26 - #24 gauge, shall be NRTL listed.

4.3.6 All terminal type connections shall be made of tin plated copper, have a welded seam and have an insulated barrel.

4.3.7 Use the following color coded terminals for the following size wire:

Yellow/Amber terminal	#26-#24 wire*
Red terminal	#22-#18 wire
Blue terminal	#16-#14 wire
Yellow terminal	#12-#10 wire

*Not NRTL rated or listed

4.3.8 The terminal shall have one (1) crimp applied. The crimping tool shall have a full cycle ratchet mechanism that provides a complete crimp before the tool can be removed.

4.3.9 Wire ends shall protrude a minimum 1/16 inch beyond the end of the barrel.

4.4. Power Connections (Also refer to Section M)

4.4.1 The Installation Supplier shall not modify connectors.

4.4.2 The preferred method of power connection is to use a non-interrupted conductor with connecting lugs at each end. Transitional devices shall only be used when no other solutions (such as narrow tongue lugs) are applicable.

4.4.3 Mechanical connections (thread pressure type) shall not be used unless the device is designed to utilize mechanical lugs only.

4.4.4 C-Taps shall not be used on power leads.

4.4.5 Mechanical "H" taps shall not be used on DC power leads.

4.4.6 The preferred method of interconnecting two cables is compression-type barrel or reducing splice using manufacturer recommended die. However, H-Taps may be used and shall be crimped with the manufacturer recommended circular die. H-taps with side taps may be used, and the side taps do not require a filler (a section of bare wire of the appropriate size); however, the branch requires a filler if not used.

4.4.7 All power cables shall be stitched in the following manner when power transition devices (H-taps, butt splices, etc.) are utilized:

a) The cables being transitioned shall have a banding Chicago stitch placed three to six inches from the transition device where two cables are coming out of the same side of the transition device.

b) All cable bends shall be made past the stitch and shall have a minimum bending radius of 7 times the diameter of the power cable.

c) All cable bends shall be made prior to crimping the transition device. If additional cable bends are required after the crimping is completed, an additional Chicago stitch shall be placed prior to any cable bends being made.

4.4.8 Transitional devices installed on power cable shall be placed between cable rack straps.

4.4.9 Transitional devices shall not be placed inside power bays, BDFBs or other power distribution bays.

4.4.10 In-line reduction (barrel) taps shall be used in preference to H-taps where possible to reduce cable build-up on the cable racks.

4.4.11 The Installation Supplier shall inspect all contact surfaces for damage(nicks to cable, etc.) prior to any crimping operation. Refer to Section J, subsection 2.3, “Damaged Cable” in the ATT-TP-76300 for proper performance criteria.

4.4.12 All battery and battery return connections shall be torqued to battery manufacturer’s specifications.

4.4.13 The Installation Supplier shall verify proper polarity before landing cables (no battery reversals). Before establishing the connection, verify that less than 0.05 volts exists between the components being connected.

4.4.14 H-Tap compression connectors shall be protected using fire retardant hard shell or soft shell covers with an oxygen index rating of 28 or better. Clear covers shall be used when available from the manufacturer.

4.4.15 All battery and battery return connections shall have a flat washer under the bolt head or screw head, and another flat washer under the nut in the through-bolt configuration.

4.4.16 All bus bar power connections shall be installed per ATT-P-05100-E.

4.4.17 Star washer-nut combinations supplied by the equipment manufacturer may be used in place of individual lock washer and nuts. A separate flat washer shall be installed between the lock washer-nut combination and the connector.

4.4.18 The exposed end of bolts or studs shall not exceed the diameter of the bolt or stud.

4.5. Compression Connections --#8 AWG and Larger

4.5.1 All electrical contact surfaces shall be cleaned by using a non-metallic, abrasive pad, wiped clean with a clean, dry cloth and have a thin coat of NO-OX-ID “A” anti-corrosive compound applied.

4.5.2 The proper connector, wire, die and crimping tool shall be used as a system to make an acceptable circumferential (e.g., hex) crimp. Normally the same manufacturer’s equipment is utilized to form the system and maintain a Nationally Recognized Testing Laboratory (NRTL) listing. All crimping tools shall have a feature that ensures positive compression.

4.5.3 The Installation Supplier shall apply crimps in such a manner as to allow inspection of the compression type connectors such that:

a) The connector shall be marked to indicate:

1. The NRTL listed wire size.
2. The number of crimps.
3. The proper die color code.
4. The NRTL and the manufacturer’s trademark.

b) The completed crimp shall be available for inspection and shall exhibit the following:

1. The crimp shall emboss the die code distinctly and legibly into the connector.
2. The number of crimps shall exactly match the connector.
3. If the die generates corners or flashing they shall be uniform and thin, with no sharp edges and excess flashing shall be removed.
4. The connector shall not be covered with a heat shrink, unless the heat shrink is clear and rated V1 or better.

4.5.4 All connectors shall be constructed of tin plated copper, except as noted below. Aluminum connectors shall not be used.

4.5.5 When tinned plated connectors are connected to bus bars a thin coat of NO-OX-ID “A” anti-corrosive compound is required.

4.5.6 Lead coated connectors shall be used when connecting to lead-acid flooded type batteries at the post or terminal plate A thin coat of NO-OX-ID “A” anti-corrosive compound is required.

4.5.7 .All connectors shall be the two (2) hole crimp type lugs except when connecting to a fuse post in a power bay or when the equipment specification drawing requires a single hole lug. Single hole lugs require an external tooth or split-ring lock washer between the bolt head and the connector, or with stud, between the nut or screw head and the connector, except when connected to a fuse post where a flat washer is also required. (Refer to AT&T Standard Drawing ATT-P-05100-E for assembly details.)

4.5.8 The proper size connector shall be used for the wire size being terminated as detailed in the manufacturer’s specifications:

a) Only one (1) wire end shall be terminated in a lug.

b) Larger wires shall not have strands removed to fit smaller connector.

c) Wires shall not be folded to fit connectors.

4.5.9 Compression type connectors shall not be attached to wire ends by soldering.

4.5.10 Wire/cable insulation shall be cut back so that, when inserted, the wire/cable extends to the full length/depth of the connector barrel or groove as viewable in the inspection hole.

4.5.11 The skinner (bare wire) shall be inserted into H-taps the entire length of the H-tap.

4.5.12 The maximum shiner (space) shall be no greater than1/16 inch between the end of the barrel and the cable insulation butt. If the shiner is greater than 1/16 inch, the space shall be covered with clear heat shrink tubing. If battery and battery return cables have manufacturer applied clear heat shrink tubing, it is permissible for the connector inspection window and compression crimps to be covered.

4.5.13 Clear heat shrink tubing shall be applied per the manufacturer’s instructions (excessive heat shall be avoided).

4.5.14 Compression crimps shall not extend onto the tang area.

4.5.15 Compression crimps shall not overlap each other.

4.5.16 All compression connectors shall have an inspection hole between the tang and the barrel.

4.5.17 Connectors terminating on a flooded lead acid battery post or battery plate shall not have an inspection hole.

4.6. Grounding Conductors

4.6.1 Unless otherwise specified, all grounding and bonding conductors shall be connected by two-hole crimp type (compression) connectors with lockwashers between the lug and securing nuts.

4.6.2 Mechanical connectors, fittings, or connections that depend solely on solder shall not be used.

4.6.3 Connections to cold water pipe or conduit shall use a Burndy type GAR-TC or equivalent connector (Refer to Figure K-5).

4.6.4 Unplated metallic surfaces shall be prepared to a bare, bright finish before joining. A thin layer of corrosion preventive compound such as NO-OX-ID “A” anti-corrosive compound shall be applied to the unplated surface. If a connector is to be secured directly to a painted surface, the paint shall be removed down to bare metal and a thin layer of a corrosion preventive compound such as NO-OX-ID “A” anti-corrosive compound shall be applied to the bare metal surface. The bare metal shall be visible for inspection completely around the lug.

4.6.5 External tooth lockwashers will be allowed between the lug and contact surface on one-hole grounding lugs with conductor size No. 8 AWG and smaller. Under this circumstance, removing paint and application of NO-OX-ID “A” anti-corrosive compound is not required. A lockwasher is always required between the lug and screw head. Verification of a locking-type washer shall be by visual inspection. Refer to Figure K-1.

4.6.6 Two grounding connectors shall not be connected back-to-back on a ground bar unless:

a) The equipment served by both conductors will be completely de-powered before the securing hardware is loosened (e.g. connections at a bus bar or an equipment enclosure), or

b) A sufficient length of the conductor that will not be permanently disconnected is both available and accessible to attach a temporary bond around the securing hardware (e.g., connections at a CO ground bar or other bus bar).

4.6.7 Bolts, nuts, screws, threaded pressure devices, raceway fittings and every ground system connecting or securing device shall be free from corrosion, properly assembled, correctly tightened and accessible for inspection. Within buildings, exothermic welding may be used at water pipes, connections to grounding system bus bars and bonds to building steel. In occupied areas within a building, the use of exothermic welds shall be restricted to those methods that use “smokeless” or “low smoke emitting” processes, such as the EXOLON® process from Erico Products, Inc

4.6.8 At all bus bars, the end of every CO grounding system conductor whose far end termination is not readily apparent shall be equipped with a 145P tag (or equivalent) identifying the termination point of the opposite end of the conductor.

4.7. Lockwashers for Grounding Connections

4.7.1 This section applies primarily to the use of lockwashers with the securing hardware for connectors used to terminate the framework grounding conductor to equipment frameworks, cabinets and other enclosures.

4.7.2 These requirements apply when lockwasher information has not been furnished by another part of this document, a standard drawing, a manufacturer's drawing or a detailed specification.

4.7.3 When a lockwasher is required, one of the following shall be used:

a) An external tooth type (ETLW) or A split ring (helical spring) type.

b) When required between the surface of a one-hole connector and the surface, to which the connector is secured, the lockwasher shall be an external tooth type. Refer to Figure K-1

c) Unless specified otherwise by the manufacturer, all types of lockwashers shall be Grade 2 or higher and shall have a zinc or cadmium electroplate finish.

4.7.4 For a fastener and nut arrangement (through-bolt) or a nut only arrangement (when a stud is used), a lockwasher shall be placed between the nut and the surface to which it mates.

4.7.5 For a fastener only arrangement (tapped hole), a lockwasher shall be placed between the fastener head and the surface to which it mates. Refer to Figure K-1.

4.7.6 Additional hardware information may be found in ATT-TP-76201*, Common Systems – Hardware Products and Materials Specifications.*

4.8. DC Power - General Connecting

4.8.1 Equipment being installed with multiple loads (i.e. "A", "B", "C", etc.):

a) shall be installed to different load supplies on the BDFB/SPDU; if there is only a two-load BDFB/SPDU available in the area, the loads shall be split with at least one on each load supply keeping the BDFB/SPDU load balanced as close as possible

b) shall maintain separate primary fuse/breaker integrity throughout the circuit

4.8.2 Power lead connections shall not be stacked (piggy backed).

4.8.3 For a single network element (bay) with multiple feeds, it is acceptable to attach the battery return leads to the return bus bar back to back (sandwiching the return bus bar between the two return lugs). The individual bay returns shall be paired to ensure that the removal of one bay will not affect another. In the event a bay has three returns, the third return shall be stand-alone on the return bar.

4.8.4 Battery return leads shall be connected to the battery return bus bar associated with the same BDFB/SPDU FB, etc., as the related battery leads.

4.8.5 Secondary power distribution cable connections to BDFB/SPDU fuse posts shall be up to the maximum power cable size (based on circuit ampacity and voltage drop requirements) allowed by the Fuse Disconnect/BDFB Manufacturer.

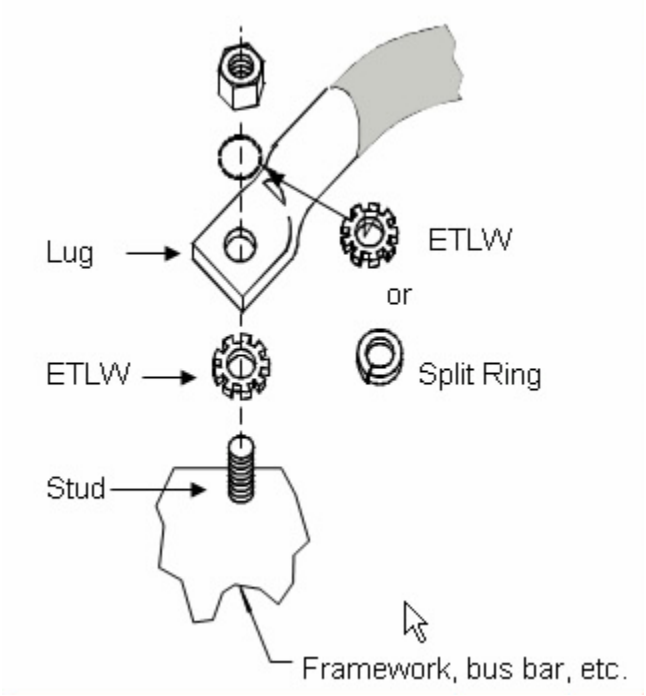
4.8.6 Secondary power distribution cabling to a 1/4-20 connection stud on a 15800 (TPS) or other type Fuse Disconnect shall be up to (≤) #2AWG. Power cabling to a 5/16-18 connection stud on a TP158HC (TPL) or other type Fuse Disconnect shall be up to (≤) 2/0AWG. (Torque requirements for 1/4-20 connections = 72in.lb.; Torque requirements for 5/16-18 connections = 132in.lb.)

4.8.7 The Installation Supplier shall apply a thin coat of NO-OX-ID “A” anti-corrosive compound to all connections of dissimilar metals to inhibit future corrosion. Cable ends shall be coated with the anticorrosive compound before making a crimp connection. All unplated connectors, braid straps, bus bars, etc., shall be brought to a bright finish and then coated with the anticorrosive compound before they are connected. .

TABLE K-1 – SUMMARY OF CHANGES IN SECTION K

Change	Item in 11/1/05 issue	Item in this Issue
Revised	2.2.3 4.4.16 4.8.5 4.8.6 Figure 2	2.2.3 4.4.16 4.8.5 4.8.6 Figure 2
Deleted		
Added		

FIGURE K-1 - APPLICATION OF LOCKWASHERS



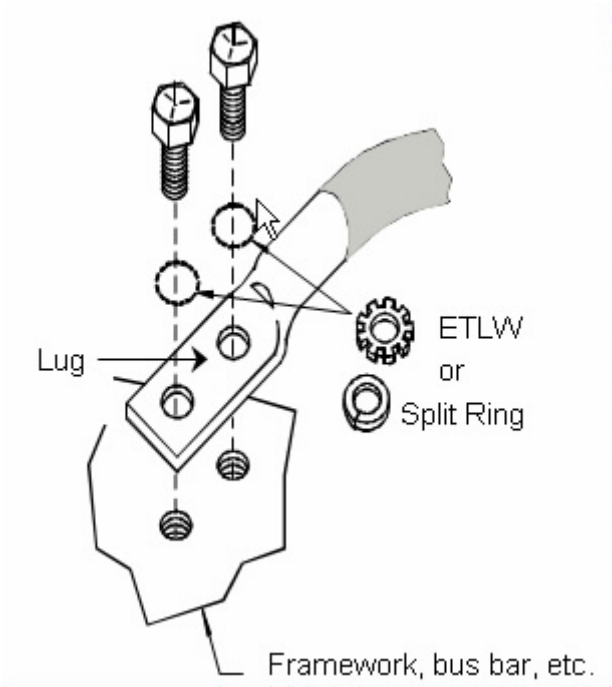


FIGURE K-2-- SOLDERLESS WIRE WRAPPED CONNECTIONS

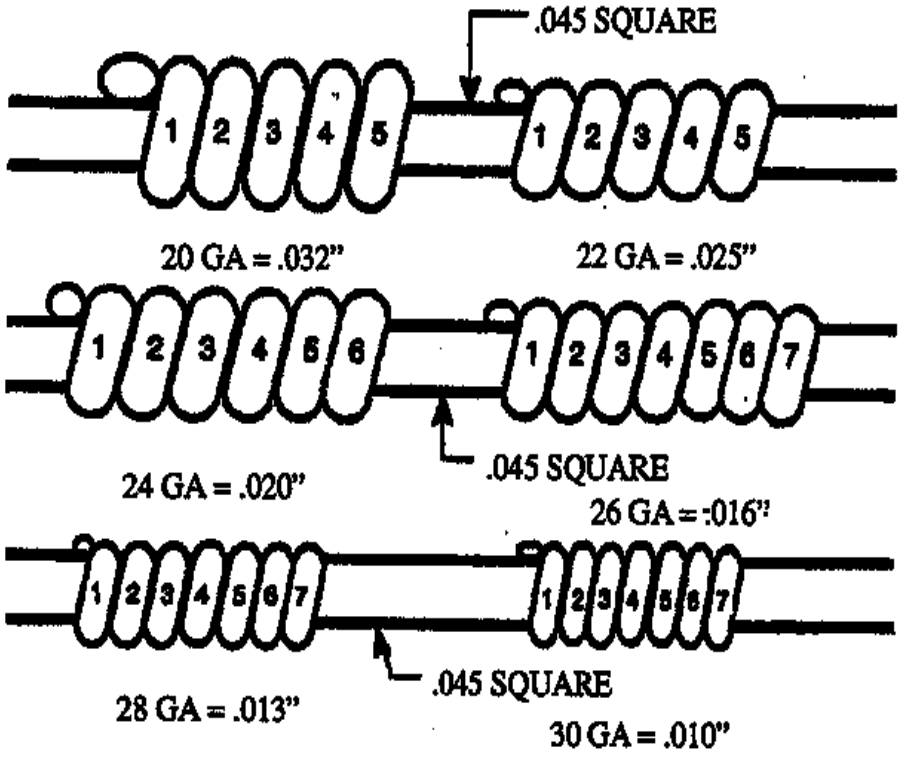
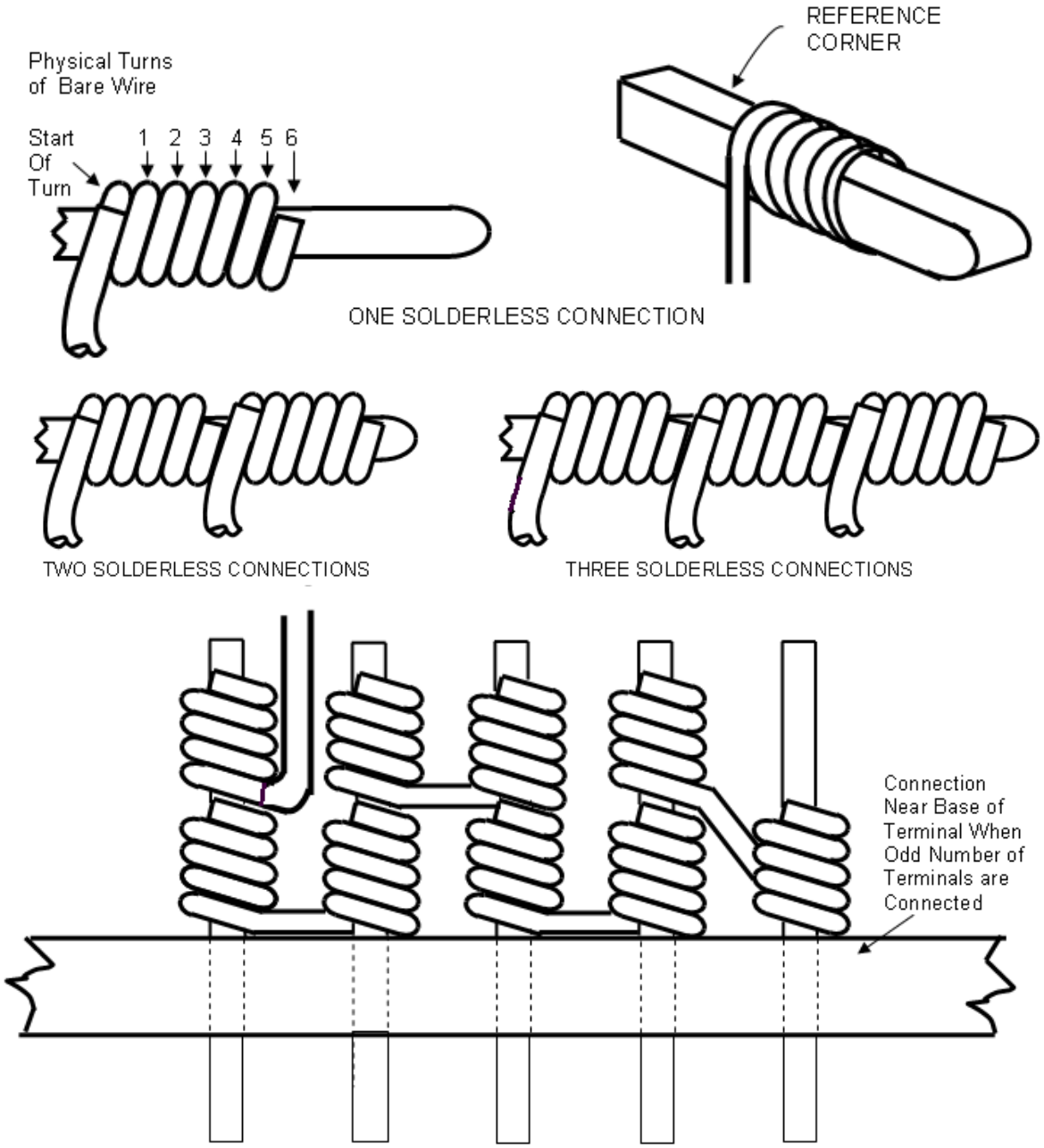


FIGURE K-3 – SOLDERLESS WIRE-WRAPPED CONNECTIONS



Note: When surface strapping is specified, connect the incoming lead at the base of the terminal and use a similar strapping arrangement.

FIGURE K-4--SOLDERLESS WIRE WRAPPED CONNECTIONS - DEFECTS

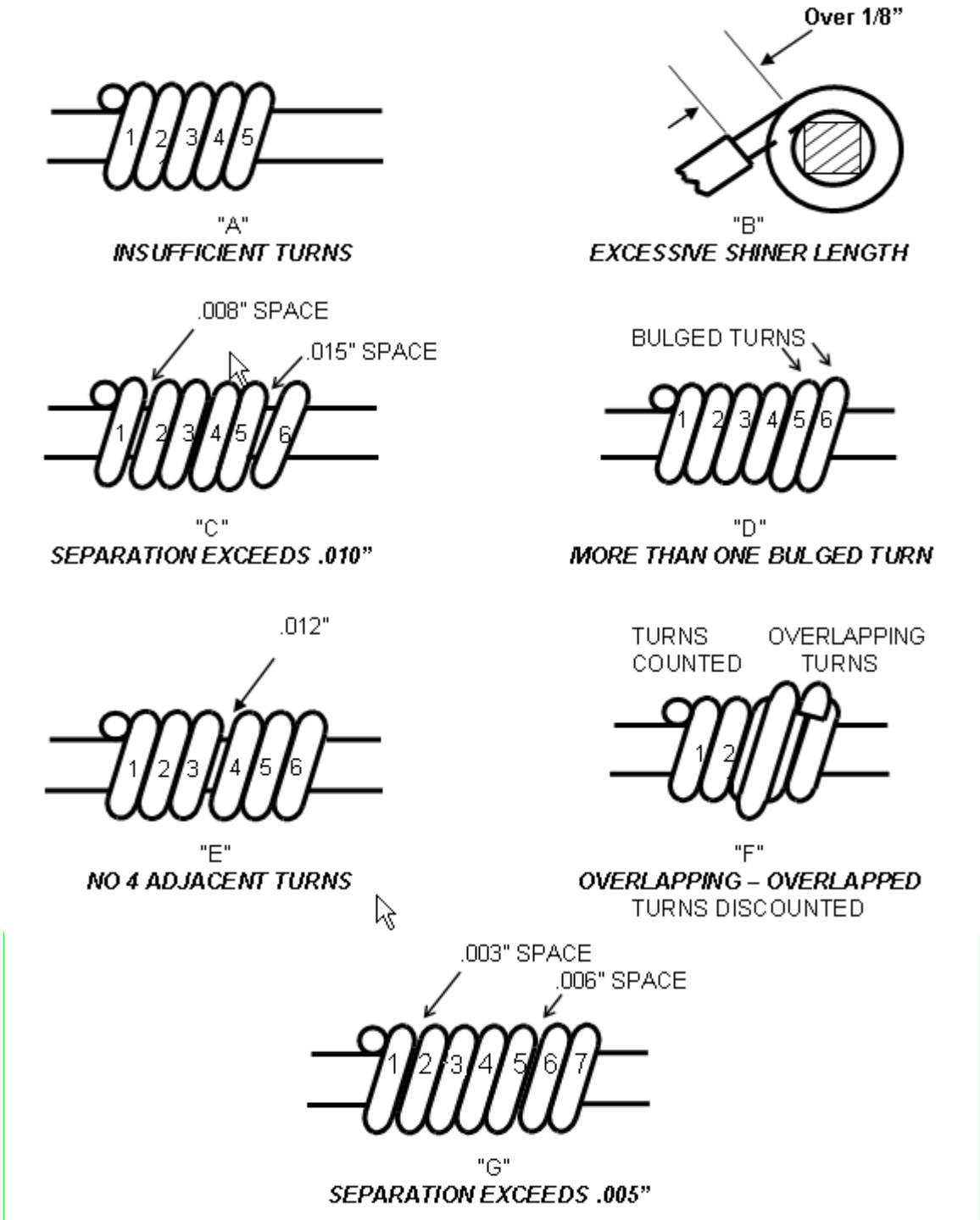
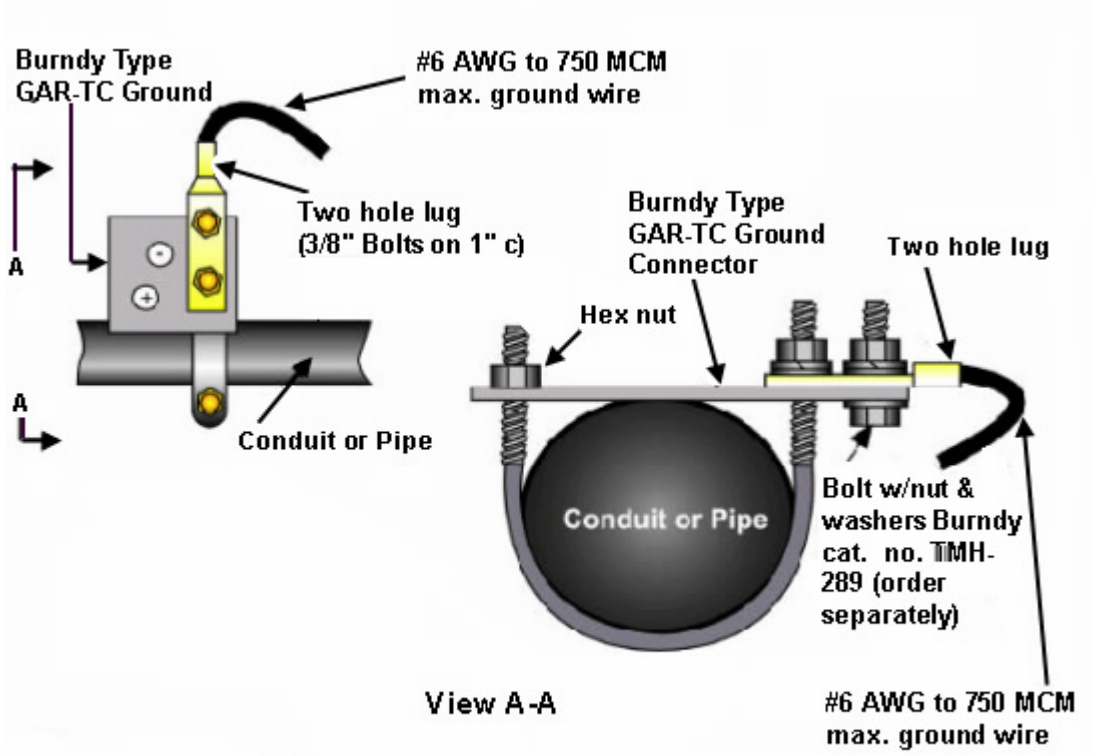
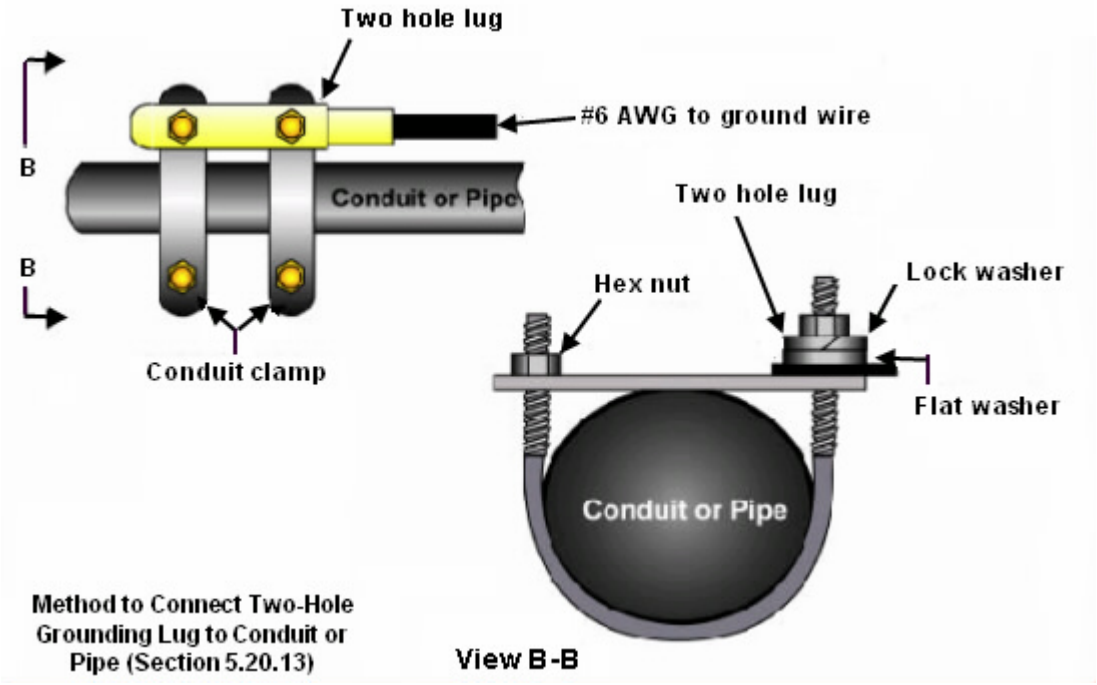


Figure K-5 - Pipe Ground Connector


Burndy Type
GAR-TC Ground
#6 AWG to 750 MCM
max. ground wire
Two hole lug
(3/8" Bolts on 1" c)
A
A
Conduit or Pipe
Burndy Type
GAR-TC Ground
Connector
Two hole lug
Hex nut
Conduit or Pipe
Bolt w/nut &
washers Burndy
cat. no. TMH-
289 (order
separately)
View A-A
#6 AWG to 750 MCM
max. ground wire


Two hole lug
#6 AWG to ground wire
B
B
Conduit or Pipe
Conduit clamp
Two hole lug
Hex nut
Lock washer
Flat washer
Conduit or Pipe
Method to Connect Two-Hole
Grounding Lug to Conduit or
Pipe (Section 5.20.13)
View B-B

[END OF SECTION]

SECTION L -- DESIGNATION REQUIREMENTS

CONTENTS PAGE

1. GENERAL

1.1. Introduction

1.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all equipment added, rearranged or modified is properly installed and in conformance with AT&T LEC installation specifications.

1.1.2 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

1.1.3 This section contains requirements for and the description of the different classes of equipment designations.

1.1.4 Changes in this issue of Section L are summarized in Table L-1.

1.2. Requirements

1.2.1 The Installation Supplier shall clean the surface to be designated. If necessary, wipe the surface using a clean rag and a non toxic cleaner, to remove any dust or oil that may be present, and touch up the painted surface with appropriate (type and color) paint.

1.2.2 All designations shall have the correct information, be at the proper location, legible from a normal distance and viewing position, the proper color, and conform to the existing office designation pattern.

1.2.3 All designations shall be sized per Table L-3.

1.2.4 When it is necessary to reduce the expected size of a designation due to insufficient space, the Installation Supplier shall use the largest size lettering that will fit in the designated area.

1.2.5 All designations shall be properly aligned and spaced.

1.2.6 Designations shall not be hand written.

1.2.7 Stamping or labeling are the only approved methods for designating equipment.

1.2.8 DESIGNATION TAGS

a) Preformed stamped fiber material that measures 1 ¾ inches by 1 inch with rounded corners and a ¼ inch hole at one end equipped with a ring. Ring shall be removed and tag shall be affixed with multi-strand waxed cord at a termination point to identify the far end termination. Typically referred to as a 145P tag and or 145P number plate.

b) Designation tags shall be installed so they are visible; not located under covers or heat shrink.

c) Designations on tags shall be sized to allow for all information needed but shall be no smaller than 1/8th inch. Both sides of the tag can be utilized. (Refer to Table L-4 for Requirements)

1.2.9 DESIGNATION MARKERS

a) Designation markers shall be ½ or ¾ inch wide tape, not to exceed 3 inches in length

b) The ½ inch wide tape shall be used when the cable, wire or fiber patch cord being marked is < ¼ inch diameter.

c) A designation marker shall not overlap itself.

d) Multi-strand waxed cord shall not be used to affix a marker.

e) Designations on ¾ inch markers shall be sized to allow for all information needed but shall be no smaller than 1/8 inch. (Refer to Table L-4 for Requirements)

f) Designations on ½ inch markers shall be sized to allow for all information needed but shall be no smaller than 3/32 inch. (Refer to Table L-4 for Requirements)

g) A designation marker on ½" tape shall have no more than 2 lines of information.

h) Designation markers shall be installed so they are visible.

i) Longitudinal Markers (Refer to Figure L- 1)

1. Clear heat shrink shall be used to protect the designations on longitudinal markers
2. Longitudinal markers shall be placed parallel to the cable with no spiraling.
3. Longitudinal markers that cannot be placed without overlapping shall be placed as a flag.

j) Flag Markers (Refer to Figure L- 2)

1. Flag markers shall not exceed 3 inches in length from the cable to the end of the flag.
2. No adhesive surface shall be exposed once flag markers is affixed.
3. Flag markers shall only have the designations stenciled on the non-adhesive side.
4. Flag markers shall not be affixed to 900 micron fiber cable break outs.
5. Flag markers shall be affixed to 2mm fiber cable break outs**.**

1.3. Stamping

1.3.1 Stamping shall be accomplished using a rubber stamp of the appropriate size.

1.3.2 The following color patterns for designations shall be used:

a) Black characters on light colored surfaces

b) White characters on dark colored surfaces

c) Red characters for Caution notices

1.3.3 All lettering and numbering shall be neat, properly aligned and applied using the correct amount of ink without smudging.

1.3.4 Rub-on stencils are not acceptable on terminal strips or frame blocks.

1.4. Labeling (Refer to Figure L-3)

1.4.1 Label Identification and designation for all batteries, battery racks, primary power equipment and associated 145P tags located in the power room or power plant vicinity shall be done with manufacturer recommended labeling or stamping. The labeling shall be applied as to adhere for the life of the equipment and use color stable, high contrast lettering. Stamping is also an approved method as required by the AT&T LEC.

1.4.2 All labels shall be on clear, black or white backing, or as manufacturer provides. Lettering shall be black or white, in contrast to the backing.

1.4.3 Labeling shall not be placed where they are exposed to repeated physical contact.

1.4.4 When applying a label to a textured or smooth surface, a piece of plastic or rubber shall be used to press the label to conform to the textured surface. This can be visually verified when the label changes from a slight haze to a clear finish.

1.4.5 Labels shall be placed so that they do not peel or lift but remain permanently affixed.

1.4.6 Labels shall not be utilized to augment existing stamping, with exception of fuse and sync record books. The Installation Supplier may either add the new information with a stamp or remove all of the existing designation and replace it with a new label. On equipment units including end guards, consistent labeling or stamping shall be done on a line-by-line basis.

1.4.7 If adhesive labels are provided by the manufacturer, the Installation Supplier shall verify that the information shown is correct.

1.4.8 The use of thermal transfer technology tape systems is limited to applications on smooth, nonporous surfaces. This tape shall not be used on ripple-finished surfaces or any other irregular surfaces.

2. EQUIPMENT TYPES

2.1. Common Items

2.1.1 The front and rear of frames and bays shall be designated with the bay number.

2.1.2 The front and rear of equipment positions shall be designated with name and number.

2.1.3 When designation cards are furnished for the top of the bay, the bay name and number shall be placed on the designation cards.

2.1.4 When bay designation cards are not furnished, the bay designation shall be placed on the base cover if it is not blocked from view by equipment. If the bay designation cannot be placed on the base cover; it shall be placed on the left upright between 4 1/2 and 5 1/2feet above floor.

2.1.5 The Installation Supplier shall designate equipment code (CLEI) on front of frames or units.

2.1.6 The Installation Supplier shall verify that all plug-in units provided with the equipment being installed are equipped with bar code labels that provide for the automatic identification of the unit. The labels shall not be damaged and shall be located so that the bar code can be electronically scanned when the plug-in is in its in-service position. No markings shall be placed over the bar codes.

2.1.7 Except in power rooms, aisle end guards shall be designated to indicate all equipment in the line up in order of appearance whenever one or more bays are added or removed in the line up. Manufacturer's end guard designations shall be utilized when provided.

2.1.8 Dedicated cable racks reserved for specific purposes (power, unfused power cable, fiber optics, etc.), except switching equipment cable racks, shall be designated.

a) Designations shall be placed on the outside of both stringers at the beginning, end and at intervals not to exceed 10 feet on horizontal cable rack.

b) These designations shall specify the purpose for which the cable rack is dedicated, followed by the word "ONLY" (e.g., Power cable only, unfused power cable only, fiber optic cable only, etc.).

c) Designations shall be made 4 ½ to 5 ½ feet from the floor on vertical cable rack. If the cable rack is dedicated to fiber optics and is yellow or orange, the cable rack need not be separately identified.

2.1.9 The year the job completed, the TEO Number and the Installation Supplier's name, in that order, shall be stamped or labeled on the front of all new equipment units. If space does not permit the placement of this information on the front of the unit, then the information may be placed on the frame upright adjacent to the equipment unit. The TEO Number may be placed only once on a fully equipped bay. If placed only once on a fully equipped bay this information shall be placed on the top left or bottom left upright of the bay. It shall be placed on each unit of a partially equipped bay. The designation format shall be as in these examples: '03 NX76235 ABC; '03 10705980 ABC. Distribution frame blocks and other minor items do not require the placement of a "Year Installed" and "TEO Number."

2.1.10 Designations shall not be placed on removable doors, covers or finishing details, unless no other area is available. If designations must be placed on removable covers, the relay rack and shelf designation shall be placed on each cover. The shelf designation shall also be placed on the shelf itself.

2.1.11 Flag markers with far-end termination details shall be placed on the unterminated end of wire not in switchboard cable (p-wire etc) that is reserved for future use. (Refer to Figure L-10)

2.2. Transport

2.2.1 When communication panels are to be added, which are to be multipled to an existing panel, the multiple destinations shall be designated on the rear of both the new and existing panels.

2.2.2 145P tag(s), with far-end termination details (e.g., shelf/bay/DF block, circuit number, TRMT/RCV, etc.), shall be placed on the unterminated end of cables reserved for future use (by the AT&T LEC) or for collocation interconnection (by the CLEC). (Refer to Figure L -4)

Note: In the case of CLEC cables, the DS0 cable tag needs to include what is designated at the MDF block. CLEC cable name and Line Splitter if designation includes Line Splitter, e.g., XXX01 (cable name) 1-100, 101-200, etc. (pairs), OE 001(bay). 01(shelf)-001-100 (ports), CP001 (bay). 01(shelf)-001-100(ports). For Fiber, DS1 and DS3 cables, the Transmit and Receive leads shall be tagged separately. (For MDF Example Refer to Figure L – 5)

2.2.3 The Installation Supplier shall designate on all transport equipment bays or shelves, with a label, visible from the front of the bay, showing the far end destinations for all conductors leaving the bay.

2.2.4 The Installation Supplier shall designate terminations associated with CLEC interconnection cabling, showing the minimum label requirements as reflected in Table L-2

TABLE L-2

Service Type	Term Type	Minimum Label Requirements
DS0	100 PR Block	Refer to Drawing ATT-E-01891, Figure 3
DS1	84 Term Panel	ACNA / Panel / Jack (i.e. SUV 04 01 – 56)
DS3	24 Term Panel	ACNA / Panel / Jack (i.e. SUV 05 01 – 03, 8, 10 – 12)
Fiber	72 Fiber Term Panel	ACNA / Panel / Jack (i.e. SUV 03 01 – 24, 49 – 72)

2.3. AC Power

2.3.1 Power Service Cabinets (PSC's) shall be supplied from the House Service Panel and are used for building distribution loads.

2.3.2 Power Distribution Service Cabinets (PDSC's) shall be supplied from the House Service Panel and are dedicated to DC power plants.

2.3.3 Protected Power Service Cabinets (PPSC's) shall be supplied from the UPS or inverter systems and serve AC protected power network elements.

2.3.4 AC building-type loads shall not be commingled with critical loads in PDSC's and PPSC's

2.3.5 Power Distribution Service Cabinets (PDSC's) and Power Service Cabinets (PSC's) shall be designated with name, number, voltage and type of service, e.g., PWR DISTG SERVICE CAB 101 200A 240/120V 1PH/ 3W FED BY PANEL "X - CB#," or PWR SERVICE CAB 101 200A 240/120V 1PH/ 3W FED BY PANEL "X - CB#," (Refer to Figure L - 6)

2.3.6 Protected Power Service Cabinets shall be designated with the PPSC cabinet designation, UPS system number, voltage and phase . The following shall also be designated in the same cabinet: CONTACT AT&T POWER ENGINEER FOR ALL AC CIRCUIT ASSIGNMENTS IN THIS PANEL. #," . (Refer to Figure L - 7 and Figure L - 8).

2.3.7 AC power service cabinet circuits shall be designated beside the circuit breaker or on the designation card with the location of the circuit being served and the circuit breaker amperage.

2.3.8 All hardwired AC powered equipment shall be designated with a 145P tag (within six inches of the connection) with the location of power source and the circuit breaker number of the power source.

2.3.9 All AC outlets and light switches shall be designated with the location of power source and circuit breaker number or inverter frame location. AC power strips with multiple outlets (such as those used with data mountings) shall be designated same as above once near the first outlet on the strip.

2.3.10 Voltage on all AC outlets shall be designated on or adjacent to the cover plate above the outlet for all voltages greater than 120 volts AC..

2.3.11 End guards for all aisle switches shall be designated adjacent to the switch with a direction arrow to indicate which aisle the switch controls.

2.3.12 "Disconnect AC Before Opening" shall be designated or labeled on trolley coupling or end cap.

2.3.13 All AC circuits originating in miscellaneous or building electrical panels (PSC's) shall be designated on the panel schedule card.

2.3.14 Inverter fed AC power service cabinets shall be designated with name, number, voltage and type of service, e.g., Protected Power Service Cabinets, PPSC CAB 001 208V AC 60 HZ 3PH 4W. The following shall also be designated in the same cabinet: CONTACT AT&T POWER ENGINEER FOR ALL AC CIRCUIT ASSIGNMENTS IN THIS PANEL. (Refer to Figure L - 7 and Figure L - 8)

2.4. DC Power

2.4.1 Power Boards (PBDs)

a) All fuse and circuit breaker positions shall be designated with frame location, fuse/circuit breaker size, load, and, if applicable, fuse panel number or equipment unit.

b) Fuse or circuit breaker numbers shall be designated on the front and back of the panel.

c) The numbering scheme for existing PBDs shall be matched; new PBDs shall be numbered similar to BDFBs; bottom to top, left to right (viewed from front) starting with shelf 1, fuse position 1, eg. 1.1.

2.4.2 Miscellaneous Fuse Bays and Panels

a) The Installation Supplier shall designate fuse panels in a miscellaneous fuse bay with row designation in configurations with multiple fuse panels and voltage designation.

2.4.3 Power Distribution Units (PDUs, i.e. Telect Fuse Panels)

a) The Installation Supplier shall designate fuse panels in a single bay with row designation in configurations with multiple fuse panels and voltage designation.

b) Fuse capacity pins shall be installed at all fuse positions that are designed to hold fuse capacity pins. The pins shall be color coded to match the fuse installed and located directly adjacent to the associated fuse. Where the fuse position is not designed for fuse designation pins, this information shall be designated on the fuse position of the fuse panel.

c) The Installation Supplier shall ensure that miscellaneous bay mounted fuse panels have a fuse record book, fuse assignment card or plate mounted on the bay upright adjacent to the fuse panel.

d) The Installation Supplier shall record equipment additions, amperages and fuse positions on the fuse designation card, record book, or bay mounted designation plate.

e) Fuse record book covers shall be designated with "Fuse Record" and bay location.

f) Fuse record card covers in PDUs shall be designated with the bay location and if applicable, the fuse panel number.

g) The Installation Supplier shall stamp, label or type added circuits on fuse record book sheets with black ink, or use lettering guide with permanent black ink. A marking pen may be used.

h) Correction fluid shall be used to remove circuit information from the fuse record book for circuits removed from fuse panels.

i) The fuse record sheet shall be retyped after a maximum of 5 handwritten additions, removals or corrections. Replacing pages shall be of the same size as existing pages.

2.4.4 BDFBs and Secondary Power Distribution Units (SPDUs)

a) Alarm fuses in BDFBs/SPDUs not mounted adjacent to the discharge fuse shall be designated to associate them with discharge fuses.

b) All fuse and circuit breaker positions shall be designated with frame location, fuse/circuit breaker size, load, and, if applicable, fuse panel number or equipment unit.

c) Fuse or circuit breaker numbers shall be designated on the front and back of the panel.

d) At the BDFB/SPDU, power load (e.g., A, B, C or D) shall be designated on the shelf (panel).

e) The Installation Supplier shall designate on the front of the BDFB/SPDU (under meter, if applicable) the size and location of the primary fuse or circuit breaker feeding the BDFB/SPDU. (See AT&T Drawing ATT-P-05410-E for an example of the labeling designation.)

f) The actual engineered voltage drop at the BDFB/SPDU (1-way, battery to BDFB/SPDU) shall be designated on the BDFB/SPDU near the power board designation.

g) BDFBs/SPDUs shall be numbered from bottom to top, starting with “1.” On horizontal panels the count will start at the bottom left and go to right. Each fuse position shall be designated with its panel and fuse position number, e.g., 2.15 (fuse panel 2, fuse position 15). See AT&T Power Drawing – ATT-P-05400-E for specific BDFB/SPDU designation requirements

h) External BDFB/SPDU battery return bus shall be stamped with the BDFB designation and the hole position numbers (first, every fifth, and last, on each bar).

2.4.5 Bus bars outside the power plant area shall be designated with potential and group designation (such as "-48V Load A," "Battery Return," etc.) in 3/4-inch lettering.

2.4.6 Battery Racks

a) The battery rack shall be designated with:

1. String ID and Voltage
2. Number of cells, Battery manufacturer model
3. Battery manufactured date

4. Date installed
5. TEO Number, and the Installation Supplier's name
6. Battery rack manufacturer and model number

b) The battery stand shall be designated to indicate the selected pilot (P) cell and the position number of each cell.

2.5. 145P Tag Requirements for DC Power (Refer to Figure L- 9)

2.5.1 All 145P tags shall be secured with multi-strand waxed cord, with a sufficient pigtail to allow the tag to be rotated for viewing. Tags equipped with metal rings shall have the ring removed.

2.5.2 Except as noted below, the Installation Supplier shall place 145P tags or equivalent, with the far end designation, on all battery and battery return leads. For leads connected to the battery return bus bar, the associated fuse number shall also be designated on the 145P tag.

a) When a network element is installed in a bay and the battery and battery return leads run to a fuse panel within the same bay, the Installation Supplier shall update the fuse designation card or fuse record book, indicating designation of shelf. 145P tags or equivalent are not required on battery and battery return leads at the network element or fuse panel.

b) When a network element is installed in a bay and the battery and battery return leads run outside the bay to a fuse panel in a different bay, the Installation Supplier shall place 145P tags or equivalent on the battery and battery return leads at the rear of the network element showing far end designation. When battery and battery return leads utilizing 16 gauge or smaller wire, one 145P tag can be used for both leads. 145P tags or equivalent are not required at the fuse panel if the fuse panel is equipped with designation card or fuse record book. Update the designation card or fuse record book.

c) Battery and battery return leads internal to switching systems do not require 145P tags.

2.5.3 Any unterminated ends of power cable shall be equipped with a 145P tag designating the far end termination.

2.6. BITS Shelves

2.6.1 Building Integrated Timing Supply (BITS) shelves shall be designated in accordance with ATT Standard Equipment Drawings.

2.6.2 Shelf labels shall be placed on the front face panel of the BITS shelf in accordance with Table L-3.

2.6.3 A designation markers for "far-end identification" shall be placed on the cable 2 to 6 inches from the butted end of the cable at both the BITS end of the circuit and at the network element end of the circuit. (Refer to Figure L – 1)

2.6.4 All cable markers shall be white with black letters. The designation marker shall be covered with either a clear heat shrink tubing (heated/shrunk) or a wrap around appliqué that covers the lettered portion.

2.6.5 The Installation Supplier shall type, stamp, label or write with the use of a lettering guide (never handwritten) all designations on the designation markers and in the BITS record book.

2.6.6 “P” or “S” shall indicate primary and secondary designations. Primary is equal to Lead A, Secondary is equal to Lead B.

2.6.7 The designation marker at the network element shall contain the far end terminating location of the BITS shelf including the bay, shelf, slot, port, and primary or secondary. (Refer to Table L – 4)

2.6.8 The designation marker at the BITS shall contain the far end terminating location. For a single timing lead to an entire bay (i.e. D4, SLC 96 bays etc.), the bay location designation is sufficient. If multiple leads are supplied for timing within a single bay (i.e. SONET ADMs, SLC SERIES 5 bays etc.), each termination shall be individually addressed. SONET ADM designations shall include the bay and shelf locations.

2.6.9 The Installation Supplier shall designate in the BITS record book the far end termination. If a TAB/db record is placed as the designation in the BITS record book, it shall be fastened in the book using the securing screws of the book. Plastic pouches and sleeves shall not be used. If a BITS record book is not available, the Installation Supplier shall request the record book from the detail engineer.

2.7. Distributing Frames

2.7.1 The vertical side of distributing frames shall be designated as follows:

a) Designate the first, last, and each fifth vertical (i.e. 1, 5, 10, 15…) with the shelf letter (i.e., A, B, C …P) on the vertical stiffening bar between the transverse arms for each shelf. The label or stamp shall be placed between the transverse arm of the vertical being identified and the next higher vertical (i.e. the label for vertical 5 would be placed between the transverse arms of verticals 5 and 6). When the frame block is added, designate the shelf letter on the lower right front of the frame block.

b) Designate the 7th (G) shelf from the floor with the vertical number at the end of the transverse arm for each vertical (i.e. 1, 2, 3…). When a frame block is added, designate the vertical number on the lower right front of the frame block.

c) Where the shelf and vertical designations intersect, designate the location with the vertical number first, followed by the shelf letter, (i.e., 1G, 5G, 10G…).

2.7.2 The horizontal side of the distributing frame shall be designated as follows:

a) Designate the first, last, and each fifth vertical (i.e. 1, 5, 10, 15…) with the shelf letter (i.e., A, B, C …P) on the horizontal stiffening bar between the transverse arms for each shelf. When the frame block is added, designate the shelf letter on the lower right front of the frame block.

b) Designate the fourth (D) and the tenth (K) shelf with the vertical number on the horizontal stiffening bar between the transverse arms. When the frame block is added, designate the vertical number on the lower right front of the frame block.

c) Where the shelf and vertical designations intersect, designate the location with the shelf letter first, followed by the vertical number, (i.e., D1, D5, D10…).

2.7.3 On the vertical side of distributing frames, circuit numbering within the block shall be from top down. Vertical block placement, low count to high count, shall follow the existing pattern

unless directed otherwise by the TEO. On the horizontal side, circuit numbers shall be numbered from left to right (facing the front of the terminal strip).

2.7.4 Cable board designations shall include vertical number, cable number, cable pair count, pair gain number and pair gain count.

2.7.5 The Installation Supplier shall stamp or label distributing frame blocks and/or covers as instructed in the TEO or drawings. The minimum requirements are:

a) Functional lead designation for each circuit type (at least one row per terminal strip)

b) Circuit designation (by name or drawing number)

c) Equipment location (relay rack number, etc.)

2.7.6 When new equipment is added, the inside and outside cover(s) of the frame blocks shall be updated.

2.7.7 For cables going to CLECs, the Installation Supplier shall designate distributing frame blocks and/or covers per drawing ATT-E-01891-E Figure 3.

2.7.8 “Tip” designation shall always precede the “Ring” designation.

2.7.9 The cable pair information shall be designated on COSMIC frames designation cards.

2.8. Grounding Designations

2.8.1 The Installation Supplier shall place 145P tags or equivalent on ground cable terminations; however, grounding conductors do not require identification of short runs when both ends are clearly visible from a point on the floor. The tag shall be designated to show the far end termination.

2.8.2 The Installation Supplier shall designate bars associated with the CO grounding system or isolated bonding network with the functional designation of the bar in 3/4-inch lettering. This includes the CO Ground Bar, Main Ground Bar (MGB), Office Principal Ground Point Bus (OPGPB), etc., and collection bars or splice plates such as Common Bonding Network (CBN) collection bar, Integrated Ground Splice Plate (INGSP), Frame Bonding Equalizer (FBE), etc. A sign at the bus bar may be used instead of stamping at the discretion of the ATT LEC Representative.

2.8.3 The MGB shall be identified with minimum 3/4" letters by way of stenciling or a designation plate. The designation shall be located so that it is easily visible from the floor. The designation may be directly on the bus bar or on the supporting cable rack or ironwork adjacent to the MGB.

2.8.4 The MGB portion of battery return bars shall be identified using stenciling or an identification plate. Lines and arrows shall also be used to identify the boundaries of the MGB.

2.8.5 The Installation Supplier shall designate the CBN side of the MGB with “Common” and the isolated side of the MGB with “Isolated”. A separation line shall be designated on the MGB to delineate the two sides.

2.8.6 Certain CO grounding system conductors shall be equipped with a brass or plastic laminate tag with the phrase "**DO NOT DISCONNECT"** designated on the tag. The letters shall be 3/16" minimum. The following conductors shall always be equipped with this tag:

a) Conductors from earth electrodes

b) Grounding conductors at a water pipe

c) Grounding electrode conductors from a house service panel or other source of a separately derived system (transformer, UPS, etc.)

d) Horizontal equalizer connections at a bus bar

e) Vertical equalizer connections at a bus bar

f) Both ends of a power plant's DC system grounding conductor

g) Both ends of grounding conductors between a protector frame and an office bus bar.

h) Conductor serving a cable entrance facility.

Note: The other side of a **DO NOT DISCONNECT** tag may be used as a destination tag.

3. FIBER OPTIC LASER WARNING LABELS

3.1. Requirements

3.1.1 Manufacturer supplied fiber optic warning labels shall be applied to the equipment per manufacturer's specifications.

4. OTHER DESIGNATIONS

4.1. DSX

4.1.1 Digital system cross connect (DSX) panels shall be designated on the front of the panel with network element connection information as leads are terminated on the panel (not required on rear). At a minimum, the following information shall be provided on designation strips of the DSX panel:

a) Frame/module name and number or relay rack number.

b) Circuit number (such as channel, bank, repeater, multiplexer, fiber terminal, etc.).

c) Jack positions shall be labeled with the first, last, and at least every fifth jack with its associated circuit number within the group.

d) On DSX-3 modules, one unused designation area shall be left for AT&T LEC use.

e) Place a circuit limit designation (brackets) when designating frame terminal strips or DSX jacks. This designation shall indicate the beginning and end of circuit terminations. It shall also be used to separate group, sub-group, functional and numeric designations.

4.2. FIBER

4.2.1 Fiber distribution frame shelves shall be designated according to manufacturer's specifications:.

4.2.2 If the manufacturer does not provide designations the fiber terminations will be identified every 6 couplers 1- 6, 7-12 etc. on the front and rear of the shelf covering the full count of the shelf.

4.2.3 Fiber optic termination panels (FOT) at the fiber distribution frame shall have far end termination designations placed on the following.

a) Manufacturer provided assignment card

b) Manufacturer provided assignment label on the front of the panel.

4.2.4 Outside of the footprint of the fiber distribution frame, fiber termination panels (FTP) shall have far end terminations placed on the front of the panel.

4.2.5 Unterminated fiber optic conductors, either individual patch cords or 2mm cable breakouts at the network element shall have far end termination designations placed as a flag style marker on each individual conductor..

4.3 Cable Hole Designations

4.3.1 Through –penetrations shall be uniquely identified as follows;

a) The cable hole designation shall be stamped on the top steel cover and face of sheathing channel of floor openings.

b) The cable hole designation shall be stamped on the covers and walls on both sides of wall openings.

c) Cable hole designations shall be centered horizontally approximately 2 inches from front edge of cover (bottom edge of wall covers).

d) Designations on cable hole sheathings shall be centered horizontally just below the top of the sheathing assembly.

Note: Cable hole numbering conventions can be found in Section 4 of ATT-TP-76400

TABLE L-1 – SUMMARY OF CHANGES IN SECTION L

Change	Item in 11/1/05 Issue	Item in this Issue
Revised	1.2.4 2.6.4 TABLE L-2 TABLE L-3	1.2.4 2.6.4 TABLE L-2 TABLE L-3
Deleted		
Added		

TABLE L-3-- SIZES OF CHARACTERS (INCHES) FOR COMMON APPLICATIONS ON FRAME AND RACK-MOUNTED EQUIPMENT

CHARACTER SIZE REQUIREMENTS IN INCHES

Refer to paragraph L1.2.4 if requirement cannot be met.

Designation Location	Size		Designation Location	Size
Aisle End Guards	3/4		HMDF	
RR/Bay Designations	3/4		Terminal Covers - Outer	3/8
Bay Name (OC 48, D4 CXR etc.)	3/8		Terminal Covers - Inner	1/8
Equipment Designations			Cable Racking (Power Cable Only, etc.)	3/4
Shelf/Panel/Unit Numbering/Lettering	3/8			
CLEI Codes	3/8		Fiber Protection System	3/4
Far End Cabling information	3/8			
Fuse Panel Assignments	3/16		AC Assignments	
			PSC, PDSC, PPSC	3/8
			Outlet / Switches	3/8
BDFB, PBD, PDB, PDF etc.			AC Panels	1/4
Fuse Position	3/8		Light Switch Aisle Arrow (length)	3/4
Fuse Assignments	3/8			
Panels	3/8		Battery Stands	
			String ID and Voltage Designation	3/4
145P Tags (see para 1.2.8 c for more info)	1/4		Number of Cells	3/8
			Battery Manufacturer or Model	3/8
DSX Panels			Battery Manufacture Date	3/8
Shelf Designations	3/8		Date Installed	3/8
Slot Assignments	1/4		Battery Rack Manufacturer and Model Number	3/8
VMDF			Year Completed, TEO, Supplier Name	3/8
Term Board	3/4			
Cable Heading	1/4		Cable Hole Cover, Sheathing, Wall	3/4
Terminal Covers - Outer	3/8			
Terminal Covers - Inner	1/8		Clock Assignments	3/16

TABLE L-4 TAG & MARKER REQUIREMENTS

	Tag or Marker from Relay Racks (far end terminations)	**Tag or Marker from Distributing Frame or Power Source**
Line 1 Front	Relay Rack (RR)– Floor Aisle and Bay	Frame Name (FR)
Line 2 Front	Shelf (SHLF) or Panel (PNL)	Block Location (BLK)
Line 3 Front	(If Required) – Slot (SLT), Card(CR)	Pair Count (PR)
Line 4 Front	Fuse (FS) or Return (RTN), Jacks (JK), Ports (PRT), Transmit (TX) or Receive (RX) (TX & RX are required)	Fuse (FS), Battery (Batt) or Return (RTN),
Line 1 Rear	CLEC ACNA	CLEC ACNA
Line 2 Rear	CLEC CLLI-11	CLEC CLLI-11

Note: A marker of ½" tape can only have 2 lines of information

FIGURE L-1

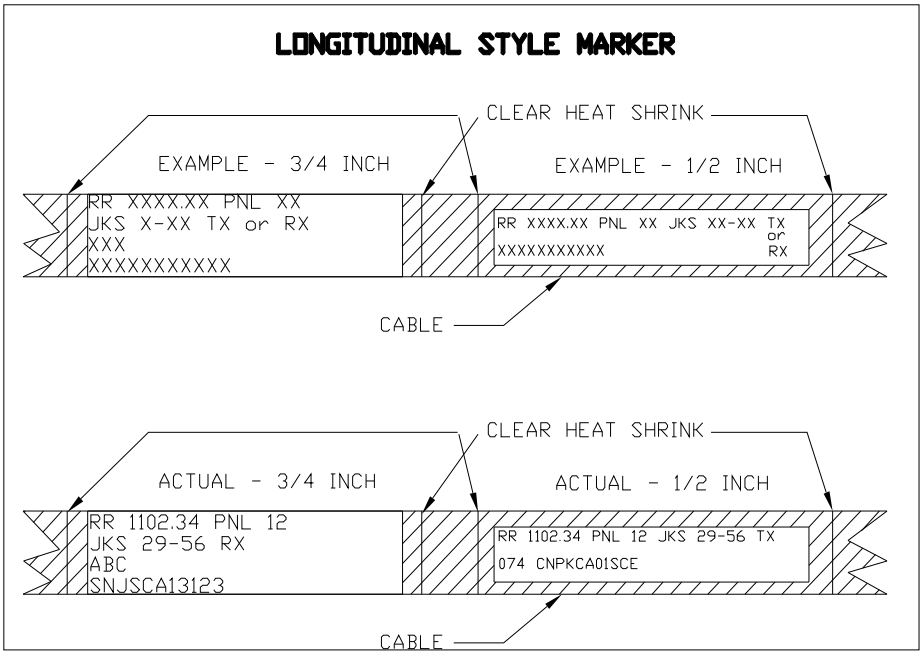

LONGITUDINAL STYLE MARKER
CLEAR HEAT SHRINK
EXAMPLE - 3/4 INCH
EXAMPLE - 1/2 INCH
RR XXXX.XX PNL XX
JKS X-XX TX or RX
XXX
XXXXXXXXXXX
RR XXXX.XX PNL XX JKS XX-XX TX
or
XXXXXXXXXXX RX
CABLE
CLEAR HEAT SHRINK
ACTUAL - 3/4 INCH
ACTUAL - 1/2 INCH
RR 1102.34 PNL 12
JKS 29-56 RX
ABC
SNJSCA13123
RR 1102.34 PNL 12 JKS 29-56 TX
074 CNPKCA01SCE
CABLE

FIGURE L - 2

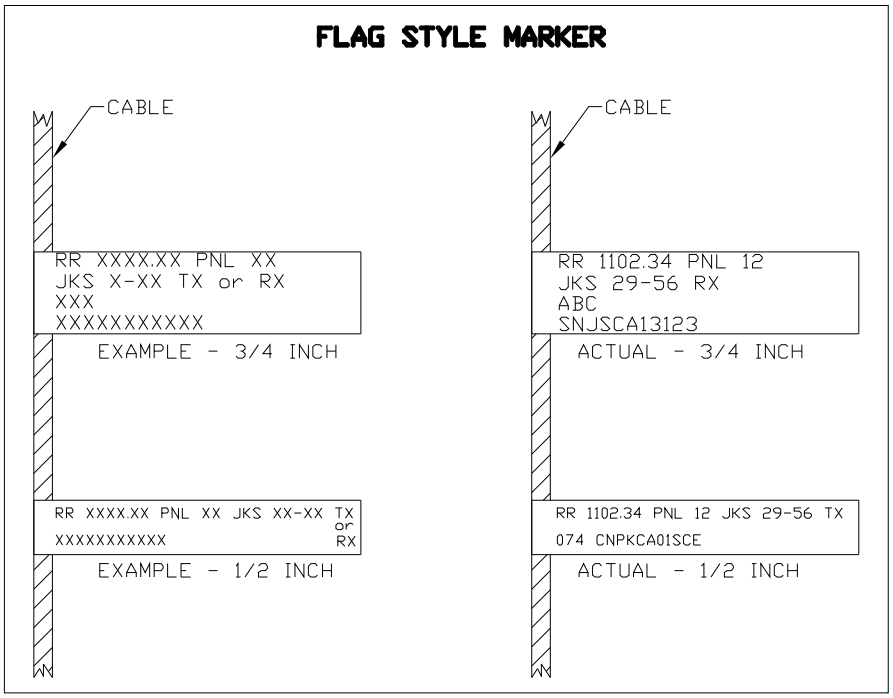

FLAG STYLE MARKER
CABLE
RR XXXX.XX PNL XX
JKS X-XX TX or RX
XXX
XXXXXXXXXXX
EXAMPLE - 3/4 INCH
RR XXXX.XX PNL XX JKS XX-XX TX or RX
XXXXXXXXXXX
EXAMPLE - 1/2 INCH
CABLE
RR 1102.34 PNL 12
JKS 29-56 RX
ABC
SNJSCA13123
ACTUAL - 3/4 INCH
RR 1102.34 PNL 12 JKS 29-56 TX
074 CNPKCA01SCE
ACTUAL - 1/2 INCH

FIGURE L - 3

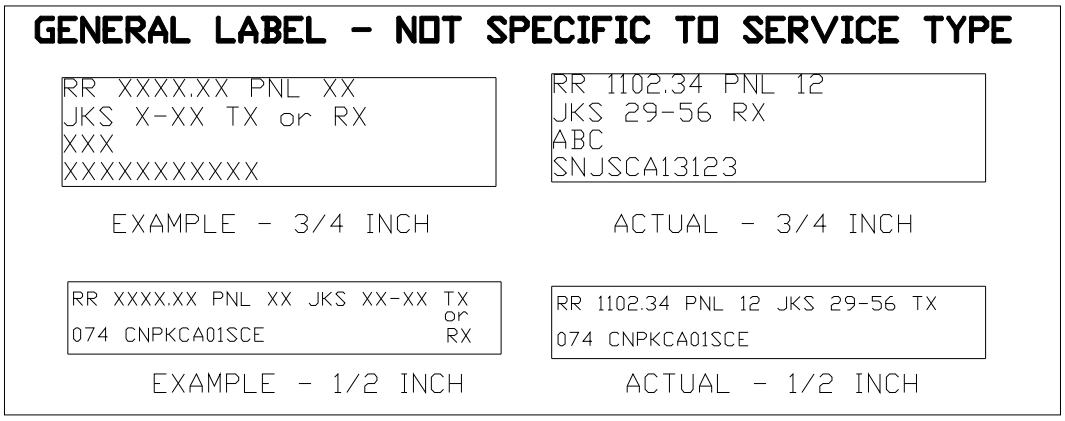

GENERAL LABEL - NOT SPECIFIC TO SERVICE TYPE
RR XXXX.XX PNL XX
JKS X-XX TX or RX
XXX
XXXXXXXXXXX
EXAMPLE - 3/4 INCH
RR 1102.34 PNL 12
JKS 29-56 RX
ABC
SNJSCA13123
ACTUAL - 3/4 INCH
RR XXXX.XX PNL XX JKS XX-XX TX or RX
074 CNPKCA01SCE
EXAMPLE - 1/2 INCH
RR 1102.34 PNL 12 JKS 29-56 TX
074 CNPKCA01SCE
ACTUAL - 1/2 INCH

FIGURE L - 4

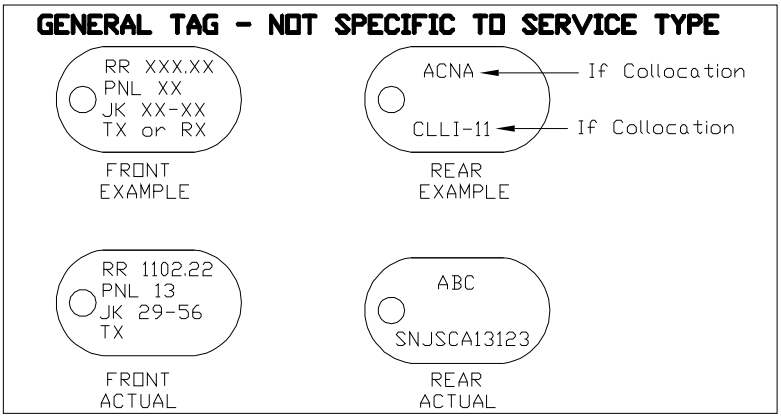

GENERAL TAG - NOT SPECIFIC TO SERVICE TYPE
RR XXX.XX
PNL XX
JK XX-XX
TX or RX
FRONT
EXAMPLE
ACNA
If Collocation
CLLI-11
If Collocation
REAR
EXAMPLE
RR 1102.22
PNL 13
JK 29-56
TX
FRONT
ACTUAL
ABC
SNJSCA13123
REAR
ACTUAL

FIGURE L - 5

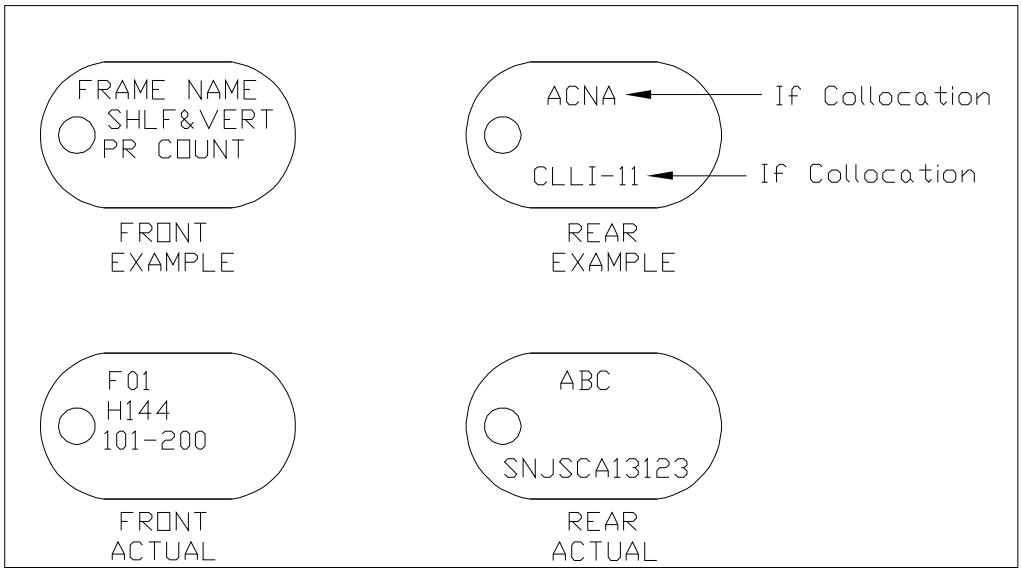

FRAME NAME
SHLF&VERT
PR COUNT
FRONT
EXAMPLE
ACNA
If Collocation
CLLI-11
If Collocation
REAR
EXAMPLE
F01
H144
101-200
FRONT
ACTUAL
ABC
SNJSCA13123
REAR
ACTUAL

FIGURE L – 6

POWER SERVICE CABINET LABEL EXAMPLE

PSC 101

120V/240V - 1P/3W

200A Fed By
Panel H10 - CB#3

FIGURE L-7

PROTECTED POWER SERVICE CABINET LABEL EXAMPLE

PPSC 01
120V/208V - 3P/4W
200A Fed By UPS 1-A

CONTACT ATT ENGINEER FOR ALL AC CIRCUIT ASSIGNMENTS IN THIS PANEL

FIGURE L-8

PROTECTED POWER SERVICE CABINET LABEL EXAMPLE

PPSC 03
120V - 1P/3W - 200A
Fed By Inverter
000.28

CONTACT ATT ENGINEER FOR ALL AC CIRCUIT ASSIGNMENTS IN THIS PANEL

FIGURE L-9

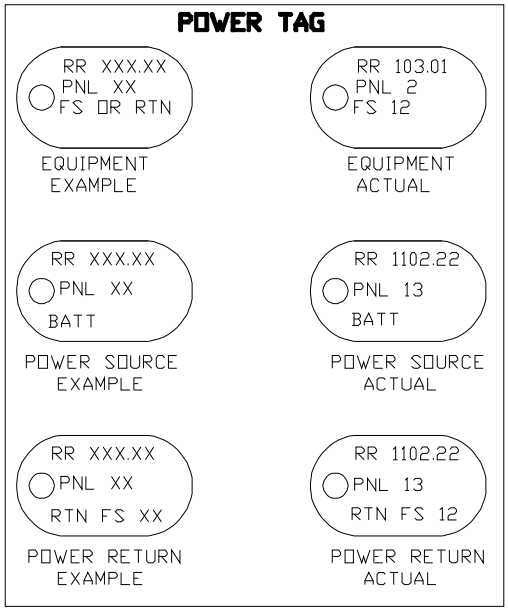
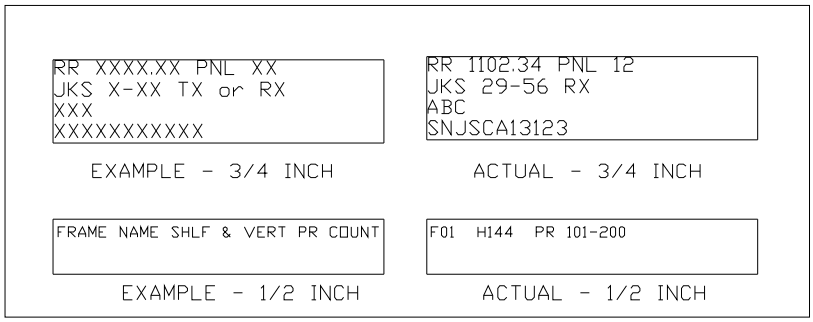

POWER TAG
RR XXX.XX
PNL XX
FS OR RTN
EQUIPMENT
EXAMPLE
RR 103.01
PNL 2
FS 12
EQUIPMENT
ACTUAL
RR XXX.XX
PNL XX
BATT
POWER SOURCE
EXAMPLE
RR 1102.22
PNL 13
BATT
POWER SOURCE
ACTUAL
RR XXX.XX
PNL XX
RTN FS XX
POWER RETURN
EXAMPLE
RR 1102.22
PNL 13
RTN FS 12
POWER RETURN
ACTUAL

FIGURE L-10



[END OF SECTION]

SECTION M -- POWER

CONTENTS PAGE

1. GENERAL

1.1. Introduction

1.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all equipment added, rearranged or modified is properly installed and in conformance with AT&T LEC installation specifications.

1.1.2 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

1.1.3 This section covers the general requirements for the installation of power equipment and associated systems.

1.1.4 Changes in this issue of Section M are summarized in Table M-1.

1.2. General Requirements

1.2.1 Due to certain regulatory and non-regulatory conditions, these listed guidelines shall apply when the installation environment is in a regulated workspace. For the non-regulated/non-utility environment, refer to the ATT-TP-76325.

1.2.2 The Installation Supplier can reference the specific installation requirements for battery, return, and bus bar hardware connections that are listed in AT&T Power Drawing – ATT-P-05100-E.

1.2.3 The Installation Supplier shall verify (with a multimeter) the absence of voltage on the battery and battery return leads before connecting the leads.

1.2.4 The Installation Supplier shall verify (with a clamp-on ammeter) the absence of current for each power lead to be removed.

1.2.5 Power equipment and bus bars shall be protected any time there is installation activity in the immediate vicinity. See Section B.

1.2.6 If electronic BDFB/SPDU load monitoring is not available at the site, the BDFB/SPDU Load Demand Worksheet (LDW) shall be used. See Section E of ATT-TP- 76300. Instructions and worksheets are also available on the Extranet Web Site if needed.

1.2.7 The record of the installation for a new BDFB/SPDU shall be completed by the power installation vendor and sent to the AT&T LEC Power Engineer and cluster vendor within five working days of the Installation Complete Date. The New BDFB Worksheet form is available on the Extranet Web Site and FileNet

1.2.8 Per NEC Article 110-26, a minimum of 48 inches of clearance shall be maintained when placing new panels and serving equipment with input voltages of 150v (AC or DC) or greater. This does not include any side panels where the equipment is built for no access.

1.3. Removal Of DC Fuses Or Opening DC Circuit Breakers

1.3.1 Unless stated otherwise in the MOP, the Supplier shall not remove a fuse or open a circuit breaker serving energized equipment. The AT&T LEC Representative is responsible for opening the circuit on energized equipment.

1.3.2 The Installation Supplier shall ensure that all circuit breakers that are spare, unassigned, or reserved for future equipment are in the "Off" position.

1.4. DC Circuit Protection Devices

1.4.1 Fuses and circuit breakers shall be of the type and capacity as indicated in the job documentation. Under no circumstances shall circuit protection devices (fuses or circuit breakers) be placed in parallel in order to increase circuit capacity.

1.4.2 Only approved GMT style and Telpower® -type fuses shall be used on DC circuits unless another type of fuse is specified in the applicable AT&T Equipment or Power Drawing.

1.4.3 Unless otherwise instructed, the Installation Supplier shall install all circuit protection devices to make the equipment operational. However, the AT&T Representative shall authorize the activation of the circuit.

1.4.4 Dummy fuses shall be installed at all open faced and GMT type vacant fuse positions.

1.4.5 Cartridge and knife type fuses shall be coated with a thin film of NO-OX-ID “A” anti-corrosive compound.

1.4.6 Blade type fuse position contacts shall be coated with a thin film of NO-OX-ID “A” anti-corrosive compound prior to fuse installation (on contact surfaces only).

1.4.7 The use of any fuse reducer shall require the authorization of the AT&T LEC Power Equipment Engineer.

1.4.8 Spare circuit protection devices shall be placed in a designated location or turned over to the AT&T LEC Representative at job completion if a spare fuse holder is not provided. .

1.4.9 On BDFBs and power boards, all local alarm wiring for associated fuses/circuit breakers shall be tested in accordance with Section E of ATT-TP-76300.

1.4.10 Connecting hardware shall be installed on all BDFB/SPDU fuse posts.

1.4.11 Secondary power distribution cable connections to BDFB/SPDU fuse posts shall be up to the maximum power cable size (based on circuit ampacity and voltage drop requirements) allowed by the Fuse Disconnect/BDFB Manufacturer.

a) Secondary power distribution cabling to a 1/4-20 connection stud on a 15800 (TPS) or other type Fuse Disconnect shall be up to (≤) #2AWG.

b) Power cabling to a 5/16-18 connection stud on a TP158HC (TPL) or other type Fuse Disconnect shall be up to (≤) 2/0AWG..

1.4.12 Circuit Protection devices shall not be installed or activated on unterminated leads (power wire/cable).

1.4.13 The largest circuit protection device to be used in a BDFB/SPDU shall be no larger than 150 Amps.

1.4.14 The Installation Supplier shall verify that all electrical contact surfaces are not damaged.

1.5. Battery Post

1.5.1 The Installation Supplier shall refer to the job documentation and cell manufacturer's documentation for specific requirements and precautions for cleaning and treating cell posts. If the cell manufacturer's recommended procedures for cell post cleaning and preparation differ from those specified in this section, then the Installation Supplier shall contact the AT&T LEC Equipment Engineer for direction.

1.5.2 All contact surfaces of flooded lead acid and VRLA battery posts and contact areas of intercell connectors shall be cleaned and coated with a thin film of NO-OX-ID "A" anti-corrosive compound.

1.5.3 All cell post connections shall be made with the proper tools and shall be tightened to the manufacturer’s torque requirements.

1.5.4 When lead-plated details and/or details with elongated holes are used, flat lead-plated or stainless steel washers shall be used under the nut and under the bolt head.

1.5.5 Requirements for connector terminations on a flooded lead acid type lead battery posts or battery plates are in Section K, ATT-TP-76300.

1.5.6 Lead coated connectors shall be used when connecting to lead acid-type batteries or battery post terminal adapter plates.

1.5.7 The maximum shiner (space) shall be no greater than 1/16 inch between the end of the barrel and the cable insulation butt. If the shiner is greater than 1/16 inch, the space shall be covered with clear heat shrink tubing. The heat shrink tubing shall cover the entire barrel portion of the lug and shall extend a minimum of 2 inches up the cable.

1.5.8 On new battery string installations, all nuts, bolts and washers shall be stainless steel, unless specified otherwise by the manufacturer. Stainless steel (316 or higher alloy) is required, and the washer shall be 1/8 inch thick. Lockwashers shall not be used on battery posts. The smooth (rounded) side of the washer shall be placed against the battery strap.

1.5.9 The threaded portion of bolts on intercell connectors shall not be installed to have exposed threads past the nut more than the equivalent diameter of the bolt.

2. DC BUS BARS

2.1. Assembly

2.1.1 The Installation Supplier shall use zinc plated SAE J429 Grade 5 or ASTM B99 silicon bronze finished bus bar joint, fastening and support bolts, screws, nuts, washers, clips, etc. The hardware shall be American National Course with a Class #2 Fit.

2.1.2 Bus bar runs shall be supported on a maximum of 6 feet 0 inch centers. Each length between joints shall be supported on both sides of a mechanical splice.

2.1.3 Bus bar runs supported by ceiling inserts, threaded rod and/or auxiliary framing channels shall be braced, both side and lengthwise, according to AT&T seismic requirements.

2.1.4 Bus bar runs shall be installed at least one foot from metal pipes, cable racks, auxiliary framing channels, etc., unless approved by the AT&T LEC Equipment Engineer. In no case shall this distance be less than three inches.

2.1.5 Bus bars shall be a minimum of 7'3" above finished floor.

2.1.6 The bus bar shall be insulated from all supporting ironwork with approved insulators.

2.1.7 Exposed bus bar splice plates with plant voltage potential, located outside the power plant environment, (e.g. above or below secondary power distribution frames, cable rack, auxiliary framing, etc.,) shall be protected, in order of preference:

a) With non-combustible covers (V-1 or better rating) , or

b) Have each bus bar and its associated cable connectors wrapped with two half-lapped layers of plastic insulating tape.

2.2. Connecting Bus Bars Together

2.2.1 Existing aluminum bus bars or details shall not be connected directly to heat producing devices. Examples are:

a) Circuit breakers

b) Fuse terminals

c) Switch terminals

d) End cells

2.2.2 Aluminum bus bars shall not be tapped for fastening terminal lugs or for fastening bar to bar. Use through-bolts, clamp joints or threaded inserts.

2.2.3 Only American Standard Unified Course (UNC) threads and hardware shall be used on all external power plant and bus bar connections (internal manufacturer power plant connections may be metric as long as there are no requirements for field installation interaction).

2.2.4 High spots, sharp edges and burrs shall be removed from all electrical contact areas, before assembly, to maximize continuity. Contact surfaces shall be flat.

2.2.5 Plated contact surfaces shall be cleaned without using abrasives and coated with a thin film of NO-OX-ID "A" anti-corrosive compound.

2.2.6 All non-plated contact surfaces shall be cleaned with a fine abrasive material then coated with a thin film of NO-OX-ID "A" anti-corrosive compound.

2.2.7 The overlap at a bus bar joint shall be no less than the width of the bus bar.

2.2.8 For bus bars, flat washers shall be used under the nut and under the bolt head. In addition, a lockwasher shall be used under the nut. (See AT&T Drawing ATT-P-05100-E for assembly details.)

2.3. Bus Bar Clamps

2.3.1 Clamps that have a bus bar contact surface concave in shape are defective and shall not be used.

2.3.2 Bus bar clamp bolts shall be equipped with self-locking pal nuts. Non-self-locking nuts shall be torqued per the manufacturer's specifications before applying a pal nut. The pal nut shall be applied with the smooth (flat) side in, open side out, run up to the regular nut, tightened and taken up only one quarter turn with an insulated wrench. On larger clamps, lock nuts

may be provided instead of pal nuts. The lock nuts shall be tightened until tension is snug against the regular nut.

2.4. Taping

2.4.1 Two overlapping wraps of plastic electrical insulating tape, (e.g., Scotch 33 or Scotch 88) (when required) shall be applied when taping bus bars with battery potential.

2.4.2 The Installation Supplier shall tape the portion of the battery return bar in close proximity to live exposed terminals, studs, etc. In power rooms or in power board lineups containing power exclusively, taping is not required.

2.4.3 Bus bars, studs, nuts and details having 150 volts or more to ground shall be taped with two layers of friction tape, unless protected by enclosures or barriers.

2.4.4 Power panels and power boards having 150 volts or less shall have exposed details taped when located in open type frames, racks, boards and bays. In power rooms or in power board lineups containing power exclusively, taping is not required.

3. FLOODED LEAD-ACID STORAGE BATTERIES

3.1. General

3.1.1 Batteries shall not be unpacked until the battery stand installation is complete and the Installation Supplier is ready to install the batteries.

3.1.2 The Installation Supplier shall not place cells of different manufacturers in the same string. Unlike strings, however, may be placed in parallel.

3.1.3 When cells in a string are replaced, the replacing cells shall have the same ampere-hour capacity, the same number of plates and shall have the same manufacturer.

3.1.4 Battery cells shall not be lifted or moved using the intercell connectors, cell posts or covers.

3.1.5 The battery marked as the pilot cell shall have a thermometer installed.

3.2. Cautions

3.2.1 While batteries are being charged, the Installation Supplier shall post temporary warning signs in conspicuous locations near the batteries as follows:

WARNING: **BATTERY GASES ARE FLAMMABLE. NO SPARKS OR OPEN FLAME NEAR CELLS.**

3.2.2 The following precautions shall be observed :

a) Provide maximum ventilation (at least 2 air changes per hour) .

b) Allow the cell to stand at least 1/2 hour on open circuit or on float voltage. If the cell has vent plugs, remove them.

3.3. Shipping Batteries for Removal or Reuse

3.3.1 When batteries are removed for non-reuse, procedures described in Section V shall be followed.

3.3.2 Batteries staged for reuse shall be prepared for shipment. Cells shall be marked and reinstalled in the same order as placed in the original installation. Miscellaneous battery items such as spark arrestors and thermometers shall be packed and stay with the cell in which they were originally installed.

3.3.3 Vents shall be covered with a shipping cap.

3.3.4 Filling tubes shall be plugged and terminals shall be protected against short circuits with tape, caps or protective packaging.

3.3.5 Each container or unit shall be marked with proper identification and address of the assignee and consignor. Also a label, 4″ x 4″ with the word “Corrosive” shall be applied to each container or unit.

3.4. Cell Unpacking, Cleaning And Inspection

3.4.1 Flooded battery cells shall remain in their protective packaging or be protected from damage until commencement of battery installation.

3.4.2 All cells shall be cleaned and neutralized thoroughly as soon as practical after they arrive on the job. Use a wet cloth in a 5% - 10% baking soda or soda ash solution, squeeze out sufficiently, and wipe thoroughly to neutralize cell top and sides. Ensure that posts, post holes and post seals are thoroughly cleaned.

3.4.3 After neutralization has been completed, the Installation Supplier shall remove salts and residue with water, wet cloth and frequent rinsing. Batteries and/or jars shall be wiped clean until dry to be sure all soda residue has been removed.

3.4.4 Solvents, mineral spirits, commercial detergents, ammonia, or other cleaning compounds or oils, waxes or polishes shall never be applied to the cell jar or lid. When such information is not provided in the job documentation (e.g., cell manufacturer's documentation) only water and baking soda or soda ash may be used.

3.4.5 The Installation Supplier shall make a visual inspection of all batteries shipped to the job site (prior to installation) to identify any physical damage, defects or problems that may prevent their proper installation, maintenance and/or operation.

The Installation Supplier shall inspect for the following defects:

- Breaks in the jar to cover seal.
- Crooked posts.
- Plates improperly supported on the bottom bridge.
- Loose paste material between the jar wall and interior.
- Bent or broken internal parts.
- Cracked jar or cover.
- Scratched, gouged, or chipped jar or cover. Indentations of more than 1/64 of an inch should be reported.
- Hairline cracks around the cell and post.
- Small dots on the post or early signs of post porosity.
- Uneven gaps or flaws in the cover.
- Crystals on plates.
- Low (touching plates) or high (at or above upper level mark) electrolyte level.

3.4.6 When uncrating cells, the Installation Supplier shall check for stains or discoloration in the packing material to locate damaged or defective cells.

3.4.7 The Installation Supplier shall install explosion proof vents when cells are first unpacked.

3.4.8 In all geographic areas, batteries awaiting installation shall be secured (strapped together in groups of four or more with non-metallic straps).

3.4.9 Unpacked batteries awaiting installation shall not be covered with a tarp.

3.4.10 Upon installation of a new battery string, the Installation Supplier shall inspect and verify that all voltage-matching stickers are of like color prior to their initial charge. The only exception being round cell technology, which does not supply the stickers. In the event that the entire string does not have like colored voltage-matching stickers the Installation Supplier shall notify the AT&T LEC Power Equipment Engineer for direction before proceeding.

3.5. Pressure Testing

3.5.1 The following testing requirements apply only when ordered by the AT&T LEC Equipment Engineer, or if any battery leakage is found in any of the cells during unpacking:

a) The Installation Supplier shall pressure test all cells. The cells shall be pressure tested after placement onto the stand to assure that they were not damaged during placement. The Installation Supplier may choose to perform an additional pressure test prior to placing cells on the rack (to avoid placing a “leaker”). This, however, does not replace the “on the rack” test.

b) Cells, posts and cover seals shall withstand a pressure of 1/2 pound per square inch for one minute without any noticeable loss in pressure. Do not over pressurize the cells.

c) Document the results of the pressure test on the Pressure Test Record (Figure M-1).

3.5.2 Pressure Test Records shall be turned over to the AT&T LEC Equipment Engineer at the completion of the job.

3.5.3 The Installation Supplier shall notify the AT&T LEC Equipment Engineer, as soon as practical, if a cell does not pass pressure tests.

3.5.4 Cells that do not pass the pressure test shall not be connected until the cell has been fixed and passed a retest, or is replaced.

3.6. Electrolyte Spills

3.6.1 All spills shall be contained and reported to:

AT&T Environmental Management at 1-866-I-WANT-EM (1-866-492-6836)

3.6.2 Refer to Section V, ATT-TP-76300 for additional requirements concerning Electrolyte spills.

3.7. Battery Water

3.7.1 Prior to initial charging, if the electrolyte level is below the bottom fill line, the Installation Supplier shall adjust the electrolyte level to the bottom fill line. No adjustment shall be made if the electrolyte level is above the bottom fill line .

3.8. Battery Preparation

3.8.1 The Installation Supplier shall notify the AT&T LEC Equipment Engineer if the electrolyte is above the upper level line when the cells are received at the job site. The Installation Supplier shall NOT remove excess electrolyte for any reason..

3.8.2 A Storage Battery Charge Report (see Figure M-2) shall be maintained on each battery throughout the installing and charging phases of battery installation. A completed copy of the Storage Battery Charge Report shall be provided to the AT&T LEC Representative at job completion.

3.8.3 The Installation Supplier shall check the installed batteries for the presence of crystals. If crystals or other defects are detected, notify the AT&T LEC Equipment Engineer. The Installation Supplier shall note the presence or absence of crystals on the Storage Battery Charge Report.

4. BATTERY RACKS

4.1. General

4.1.1 Battery racks shall be positioned, assembled, aligned, grounded, designated and installed as specified in the job documentation, ATT-TP-76300, and the rack manufacturer's documentation.

4.1.2 For personnel protection, creating sparks while working with batteries shall be avoided. To avoid Electrostatic Discharge (ESD), the Installation Supplier shall perform one of the following steps prior to beginning each work operation involving battery work:

a) Firmly touch a grounded metal rack/object or battery termination plate near the return (grounded) end of the battery for the removal of static electricity.

b) If the battery stand is equipped with an ESD ground termination, an ESD wrist/ankle strap may be used for self-discharge. However, it is not the intent to require the technician to wear the device while working on the batteries.

4.1.3 The following are minimum clearances between a battery rack and other battery racks, equipment, rigid spill containment and non-movable obstructions. The Installation Supplier shall notify the AT&T LEC Equipment Engineer if the minimum requirements cannot be met to determine resolution.

a) Adjacent or parallel racks - 36 inches.

b) Double row rack and a wall - 36 inches.

c) Equipment or bays - 36 inches.

d) Walls - 36 inches. This applies to the end of a rack where the length of the rack exceeds 72 inches. A single row rack parallel to a wall shall be a minimum of 8 inches from the wall. The clearance of a rack shall be a minimum of 8 inches from another structure at one end of the rack (the other end requires 36 inches). At no time shall fire aisles be blocked.

4.1.4 On a two-tier, two-row, two-string, battery rack each of the battery strings shall have cells 1 through 12 on the bottom tier and 13 through 24 on the top tier.

4.1.5 In seismic zones 3 and above, cell separators shall be installed between battery cells. Manufacturer supplied battery container support cradles may be used instead of cell separators if they minimize battery movement.

4.1.6 In seismic zones 2 and below, cell separators or container support cradles shall be installed between battery cells if shipped by the battery manufacturer.

4.1.7 Only material that meets an oxygen index of 28 or better shall be used as cell separators. (Styrofoam packing material shall not be used as separators.)

4.1.8 When tie rods are required for seismic protection on a battery stand installation, it is permissible to double nut the battery stand tie rod on both ends.

4.1.9 Battery cells shall not touch each other or adjacent framework.

a) The spacing between the cells in a row shall be 3/8" to 5/8".

b) The spacing between the rows of cells shall be greater than 3/4"

c) Side and end-rail clearance to the battery jar shall be 1/32" to 1/8". On installation, PVC jars should be set up with the maximum clearance to allow for jar growth.

4.2. Battery Cabling (Unfused)

4.2.1 Size 4/0 flexible type power cable shall be the standard size and type to be used on all cells through 1800 AH. A cable size of 350 kcmil, flexible type power wire shall be used on all cells over 1800 AH.

4.2.2 Cables between the battery posts and battery bus bar shall be installed as shown in Table M-3.

4.2.3 Cable runs, from bus bar drop plates to cell posts shall have sufficient slack to allow 6 inches of movement.

4.2.4 The Installation Supplier shall install the same quantity of inter-tier and inter-shelf conductors.

5. CHARGING STORAGE BATTERIES

5.1. Charging

5.1.1 Before charging is started, the Installation Supplier shall designate the cell with the lowest specific gravity as the Pilot Cell (a.k.a Temperature Reference Cell). The Pilot Cell shall be located on the lower shelf of the stand. Do not place the Pilot Cell on the end of a stand, near a window, or near a heating/cooling vent.

5.1.2 When more than one string is charged in parallel, the Installation Supplier shall select a separate Pilot Cell for each string.

5.1.3 The Installation Supplier shall record the Pilot Cell number in the appropriate box on the Storage Battery Charge Report (Figure M-2). Indicate number of strings charged in parallel and voltage regulation employed.

5.1.4 The Installation Supplier shall insert a thermometer in the Pilot Cell so the temperature reading can be taken without touching the thermometer. The Pilot Cell is used for the purpose of temperature measurement for the hours of charge.

5.1.5 The Installation Supplier shall provide its own portable battery charger with a protective fuse device.

5.1.6 Before installation, batteries shall be charged in accordance with manufacturer's recommendations.

5.1.7 When using a voltage regulated charger delivering at least 12 amps, the Installation Supplier shall monitor the initial charge.

5.1.8 Just before the start of initial charge, the Installation Supplier shall measure the cell temperature of the Pilot cell and determine the total length of initial charge requirement by referring to corresponding Cell Temperature column and Time On Open Circuit column of Table M-2. The required time on charge begins at the time that the voltage and current have reached steady state operation.

5.1.9 The Installation Supplier shall ensure that adequate ventilation is present to prevent the hydrogen concentration from reaching the 1 percent level at any time during the charging process. Warning signs shall be placed near the charge area. For information regarding ventilation requirements, refer to Section 6 of ATT-TP-76400.

5.1.10 Explosion proof vent caps and shipping plugs (for the electrolyte draw-off tubes) shall be firmly in place on each cell during cell charging activities.

5.1.11 Before performing any work functions, the Installation Supplier shall touch any bare metal grounded part of the battery rack to avoid ESD to the batteries.

5.2. Charging Records

5.2.1 The Installation Supplier shall complete the Storage Battery Charge Report (Figure M-2) for each battery string. Document the voltage, specific gravity and temperature of each cell at the following intervals.

a) Prior to start of initial charge (indicated in Initial Charge section of Figure M-2)

b) At end of charge, prior to turn-down to float

c) 72 hours after end of initial charge

5.2.2 The Installation Supplier shall document (on the Pilot Cell Charge Report, Figure M-3) the time, charge current, voltage and temperature of the pilot cell, at the following intervals:

a) At the start of charge.

b) Once each hour for the first eight hours of charge.

c) Three times a day after the first eight hours of charge.

d) Just before charging is stopped or temporarily discontinued. Reference the manufacturer's documentation to establish the recommended procedure to determine and record full charge.

e) When charging is restarted (if initial charge is interrupted) and the charge current is stable.

5.2.3 All Storage Battery Charge Reports shall be placed in the central office retained battery records book or separately turned over to the AT&T LEC Representative. A copy shall be placed in the yellow wallet.

5.3. Electrolyte Level

5.3.1 While batteries are on initial charge, the electrolyte level may rise above the maximum level line. If it should become necessary to remove electrolyte to prevent overflow, the Installation

Supplier shall make note of removals on the battery initial charge records. Retain electrolyte for possible reuse at the cell level.

5.3.2 Electrolyte not reused shall be disposed of in accordance with Section V, Hazardous Material and Waste Management of the ATT-TP-76300.

5.3.3 After the initial charge, distilled water shall be added to bring the electrolyte midway between the lower and upper level lines. If the electrolyte level exceeds the high mark, the Installation Supplier shall note the high level on the initial Storage Battery Charge Report in the comment section, but shall not make any adjustment in the electrolyte.

5.4. End Of Initial Charge Crystal Identification

5.4.1 Before stopping the initial charge, the Installation Supplier shall record the following for each cell on the Storage Battery Charge Report:

a) Voltage

b) Specific gravity

c) Electrolyte temperature

5.4.2 After a satisfactory initial charge, there shall be no crystals or discoloration present on the plates when examined with a flashlight.

5.4.3 Cells that are not free of crystals after the initial charge may contain an internal short. If some cells still have crystals after the initial charge, it is recommended that the battery string be continued on boost charge at 2.5 to 2.55 volts for a total charge time not to exceed 250 hours for both charges. If charging fails to clear the crystals within 250 hours, the cells shall be referred to the AT&T LEC Equipment Engineer for investigation and/or replacement.

5.5. Turnover

5.5.1 The Installation Supplier shall ensure that the full-charge specific gravity of each cell meets the manufacturer's documentation and does not vary by more than 0.015 (15 points) per cell.

5.5.2 On the installation of new battery strings, the power plant float voltage shall be upgraded to 52.80 volts if not already at that float setting

5.5.3 Cell voltage shall have a measurement between 2.15 and 2.25 volts for the recommended 52.80 Power Plant Voltage; or between 2.12 and 2.22 volts for a 52.08 Power Plant Voltage.

5.5.4 All charged strings shall remain on continuous uninterrupted float voltage of 2.20 (52.80 Power Plant Voltage) or 2.17 (52.08 Power Plant Voltage) volts per cell until placed in service.

5.6. Valve Regulated Cells

5.6.1 The manufacturer recommendations and forms shall be utilized for installation of valve regulated cells.

5.6.2 The Installation Supplier shall record individual battery conductance values before battery charge.

5.6.3 Valve regulated lead-acid (VRLA) cells shall have a float voltage measured at 2.25 volts, plus or minus 0.05 volts.

5.6.4 For initial charge, temperature compensated chargers shall be used to insure that thermal runaway does not occur.

5.7. Flooded Nickel Cadmium

5.7.1 The manufacturer recommendations and forms shall be utilized for the installation of NiCad cells.

5.7.2 The Installation Supplier shall perform and record an Open Circuit Voltage (OCV) for each cell before installation. Any cell with less than 1.10 volts shall be replaced.

5.7.3 The NiCad battery strings for Central Office applications contain 38 (1.43V) cells that shall have a string float voltage measured at 54.4V for optimum performance. The float voltage can be reduced to 1.42 volts per cell (54.0 string float) if there is an adjustment issue with high voltage alarms.

5.7.4 The higher than normal 54.4V float voltage requires that a power plant be entirely supported by NiCad batteries. Strings of flooded lead acid batteries or VRLA batteries shall not be mixed with NiCad battery strings.

5.7.5 Recommended alarm points for the 54.4 float are: Very High Voltage – 56.0V; High Voltage – 55.5V; Low Voltage – 52.0V; Very Low Voltage – 48.0v.

5.7.6 Saft® NiCad NCX-125 Battery Drain Table end voltage is 1.10V per cell; 42V for a 38 cell string after delivering up to a constant 28.5A current discharge for 4 hours when new. Load bank testing shall be performed at 35.2A for a Saft NCX-125 battery string.

5.7.7 Battery racks that house the NiCad batteries shall have sliding shelves allowing adequate working space, and shall meet the seismic rating for the geographic area.

5.7.8 Battery cabling between the battery strings and the bay collection bars shall be continuous; the use of Anderson or Anderson-style quick-connectors is prohibited.

5.7.9 Size 2AWG flex cable shall be used to connect up to 125AH NiCad battery strings shelves to the rack battery and return bus bars (collection bars). The use of the 2AWG flex cable allows easy movement of the shelves for battery servicing. For this application, gray cotton braid flex-cable is preferred over the black rubber insulation.

5.7.10 Battery collection bars shall be installed at the top of the NiCad bay(s).

5.7.11 Tin plated copper lugs without inspection holes and nickel plated steel hardware shall be used for NiCad battery connections.

5.7.12 NiCad battery hardware shall be Saft® supplied as standard metric threads are not compatible with the Saft® NiCad battery connections.

5.7.13 NiCad battery connections shall be torqued to 50 inch-pounds.

5.7.14 Saft® NOX-Rust corrosion inhibitor shall be used on all external battery connections.

5.7.15 NiCad batteries contain a corrosive alkaline electrolyte solution that shall be neutralized with a special NiCad spill kit (which is labeled in bright orange). Spill kits for flooded lead acid batteries do not contain the correct neutralizing absorbent for NiCad batteries, and the lead acid battery safety equipment shall not be used when cleaning up a NiCad electrolyte spill due to the potential of a dangerous chemical reaction.

5.7.16 NiCad batteries can release hydrogen gas, and the same safety precautions regarding gassing and explosion hazard apply to NiCad as flooded lead acid battery installations.

5.7.17 NiCad batteries shall use constant voltage charging to maintain float voltage. Temperature compensated voltage control for VRLA application is not recommended.

5.7.18 High float current on a NiCad battery string is an indication there is a maintenance issue or the battery is reaching end-of-life.

5.7.19 NiCad batteries shall be recycled through the manufacturer.

5.7.20 Additional details regarding NiCad batteries can be found in AT&T Power Drawing – ATT-P-05330-E.

5.8. Alternative Battery Technologies

5.8.1 All new battery technology shall be installed with charge records, maintained and serviced per the manufacturer's documentation.

6. FLOODED LEAD-ACID STRING TRANSITIONS

6.1. General

6.1.1 Prior to and during battery transition work, air flow in the battery area shall be increased to two air changes per hour to eliminate the buildup of hydrogen gas.

6.1.2 The Installation Supplier shall ensure that temporary wiring for transition batteries is never less than two 4/0 or one 500 kcmil for 1680 AH and smaller or two 500 kcmil for strings larger than 1680 AH.

6.1.3 The Installation Supplier shall ensure that the battery string to be transitioned has been on a stable float charge for at least 48 - 72 hours so that hydrogen gas release is minimal. Only one string shall be taken off line at a time. When opening a string, the installation supplier shall cover cable ends by taping on a heat shrink cap after removing bolt assemblies.

6.1.4 When necessary, the transition string voltage shall be raised to adjust voltage differences to 0.05 volts or less. The AT&T LEC Representative must approve any decision to lower the plant voltage for a battery transition. The plant voltage shall never be lowered more than 2.0 volts from the normal float voltage for a -48 volt plant.

6.1.5 In all cases, the plant voltage shall be kept within the operating limits of the equipment served by the battery plant.

7. AC POWER IN THE DC OPERATING (REGULATED) ENVIRONMENT

7.1. AC Panels

7.1.1 Per the NEC, all newly placed AC panels and serving equipment with AC input voltages 150v AC or greater shall maintain a minimum working clearance of 48 inches. This does not include the rear or side(s) when the equipment is built for no access.

7.1.2 Circuit Breaker additions to existing AC Panels (PSC/PDSC) shall be validated for the existence of available capacity. Additional distribution circuit breakers shall not be added to

the (PSC/PDSC) AC Panels where measured demand exceeds 80% of the primary supply circuit breaker. Installation Suppliers shall notify the responsible AT&T representative where the 80% levels have been met or exceeded.

7.2. AC Cabling

7.2.1 All AC conductors must be enclosed in a conduit, metal raceway or trough.

7.2.2 All final AC equipment connections, or conduit transitions from walls or columns in Seismic Zones 3 & 4, with Jacketed Metallic Clad (JMC) flex (Seal-Tite® or Liquidtight® rated UL 94 V-0) shall not exceed three feet.

7.2.3 In High Seismic areas where JMC is used between the wall or column and conduit supported by auxiliary framing, the Installation Supplier shall install the JMC with a minimum of six inches of play.

7.2.4 Final AC lighting fixture connections with Jacketed Metallic Clad (JMC) flex (Seal-Tite® or Liquidtight® rated UL 94 V-0) shall not exceed six feet.

7.2.5 Jacketed Metallic Clad (JMC) flex (Seal-Tite® or Liquidtight® rated UL 94 V-0) may be run a distance greater than three feet only within bay end-guards and bases to connect light switches and bay test receptacles. The JMC shall not have excessive slack or be coiled within the bay end-guard or base.

7.3. AC Test Receptacles

7.3.1 All work on AC circuits shall be done in compliance with the technical requirements of the NEC and applicable local electrical codes. Note: AC circuits serving communications equipment and lighting are exempt from the administrative requirements of the NEC and local electrical codes for example, permitting and inspection.

7.3.2 While work is being done on AC circuits, fuses shall be removed or switches opened whenever it is practical to do so without causing a service interruption.

7.3.3 When work is being performed that requires removing the electrical potential from an operating circuit, the circuit shall be identified with a "**Warning - Working on Circuit**" tag at the AC source. The tag shall only be removed by the person performing the work.

7.3.4 An Alternating Current Equipment Ground (ACEG) lead shall be provided with each AC circuit. When a conduit contains more than one AC circuit, one ACEG lead may be used if properly sized per the NEC.

7.3.5 The spacing of AC test receptacles shall be every third bay, not to exceed 10 feet in equipment frames. A single or stand-alone frame shall have a test receptacle provided or placed in the base. If a single or stand-alone bay to be installed has not been engineered with a test receptacle, the Installation Supplier shall contact the DESP for resolution.

7.3.6 AC test receptacles shall be mounted flush and equipped with a cover plate.

7.3.7 The Installation Supplier shall ensure that the grounding and polarity of AC test receptacles are correct, verified and recorded on the test record.

7.3.8 The entire length of the metallic raceway, conduit or trough shall provide a continuous conductive path for grounding.

7.3.9 The Installation Supplier shall install bushings, nipples or connectors to protect wiring. Exposed AC conductors shall not be in contact with edges of metal frameworks, boxes or raceways (e.g. running through a knockout).

7.3.10 Isolated ground AC receptacles (orange) shall not be installed.

7.3.11 Dedicated (non test receptacle) AC receptacles shall be installed in the same bay/frame as the equipment load the receptacle serves.

7.3.12 The Installation Supplier shall install a green ACEG lead for all AC lighting fixtures.

7.3.13 Wire and cable utilized to distribute AC power shall be exclusively copper conductors.

7.3.14 A wire nut shall be used to cover the exposed ends of all AC conductors.

7.3.15 Wire nuts shall meet the V-1 oxygen index rating or better.

7.3.16 The maximum number of duplex appliance outlets allowed on a branch circuit shall not exceed 20 for a 15 Ampere circuit breaker or 26 for a 20 Ampere circuit breaker.

7.3.17 Branch circuit conductors serving appliance outlets shall be, at a minimum, #12 AWG copper and no larger than #8 AWG copper. All conductors shall be insulated to 600 volts and meet the requirements of the National Electrical Code.

7.3.18 From a PDSC to the end of a branch circuit serving duplex appliance outlets, the length of the branch circuit shall not exceed:

145 feet for #12 AWG conductors

225 feet for #10 AWG conductors

360 feet for #8 AWG conductors

7.4. Conduit

7.4.1 Refer to Section I of TP76300 for information regarding conduit.

7.5. Branch Circuits

7.5.1 When adding new branch circuits, fluorescent lighting or extending existing circuits, the Installation Supplier shall verify that no additional connection is made between the added neutral (white wire) and the required green wire ground (ACEG).

7.5.2 When extending an existing circuit, the Installation Supplier shall insure that the rating of the circuit protection device is not exceeded.

7.6. Lighting

7.6.1 Airey-Thompson lighting fixtures shall be installed per manufacturer's instructions.

7.6.2 LumiCool lighting fixtures shall be installed per manufacturer's instruction and ATT-TP-76202.

TABLE M-1 – SUMMARY OF CHANGES IN SECTION M

Change	Item in 11/1/05 Issue	Item in this Issue
Revised	1.4.11 3.4.5 7.2.2 7.2.4 7.2.5	1.4.11 3.4.5 7.2.2 7.2.4 7.2.5
Deleted		
Added	7.2.3 7.3.16 7.3.17 7.3.18	7.2.3 7.3.16 7.3.17 7.3.18

TABLE M-2--TOTAL HOURS OF CHARGE AT 2.50 - 2.55 VOLTS PER CELL

(NOTE A)

Time (T) on Open Circuit (Note C)	**Cell Temperature - Measured at Open Circuit Voltage (Note B)**		
	81 Degrees (F) and above	65 - 80 Degrees (F)	64 Degrees (F) and Less
T ≤ 4 months	100 hours	150 hours	200 hours
4 months < T ≤ 6 months (lead calcium)	150 hours	200 hours	250 hours

NOTES: A. Total charging time shall not exceed 250 hours.

B. Cell temperature will be determined by selecting a Pilot Cell ("Temperature Reference Cell

C. Time on open circuit is determined from the "charge by" date on the shipping container. The "Charge By" date is that date when the open circuit time will be 6 months.

TABLE M-3--CONDUCTORS FOR BUS DROP TO CELL POSTS

Cells AMP HR Capacity 8 HR Rate	**Conductors**	
	Number	**Size**
<420	1	4/0
>420	2	4/0
<840	2	4/0
>840	4	4/0
1680 - 1800	4	4/0
>1800	4	350 kcmil

FIGURES M-1, M-2 AND M-3

A reproducible copy of a Pressure Test Record (Figure M-1), Storage Battery Charge Report (Figure M-2) and Pilot Cell Charge Report (Figure M-3) are provided on the following pages.

PRESSURE TEST RECORD

Battery Manufacturer:				Model:	
Installation Supplier:					
OFFICE		1/2 PSI PRESSURE TEST CHECK LIST		SPECIFIC GRAVITY	CELL VOLTAGE
STRING ID				Prior to initial Charge To Select Pilot Cell	Prior to initial Charge For Records Only
CELL NO.	SERIAL NO.	WHEN RECEIVED	"ON RACK" TEST		

STORAGE BATTERY CHARGE REPORT

OFFICE CLLI	PLANT ID	STRING ID	TELCO JOB NO.	BATTERY MANUFACTURER	Sheet ( ) of ( ) sheets.
OFFICE ADDRESS		CELL TYPE	MANAFACTURE DATE	INSTALLATION SUPPLIER & DATE INSTALLED	

	READINGS 72 HOURS AFTER END OF INITIAL CHARGE. DATE:_____				FLOAT READINGS AT END OF CHARGE DATE:_____			INITIAL CHARGE					
												Pilot Cell No. _____	
CELL NUMBER AND SERIAL NUMBER	Crystals (Round Cells) Y=Yes N=No	Volts In Excess Of 2.000	S. G. In Excess Of 1.000 Corrected	Temp. In Degrees ºF.	Volts In Excess Of 2.000	S. G. In Excess Of 1.000 Corrected	Temp Degrees ºF.	Date	Hour Of Charge	Charge In Amps	Cell Voltage	S. G. corrected	Temp In ºF.

Average Cell Voltage	Total Hours Of Charge
Comments:	
	Measurements By:

Use a separate form for multiple strings

PILOT CELL CHARGE REPORT – PAGE 1						
Office CLLI				Power Plant ID:		
Telco Job No.:						
Installation Supplier Name						
Installation Supplier Contact Telephone No.:						
Name or Person making measurements:						
String ID:						
Pilot Cell #		Reading Date and time		Pilot Cell Readings		
Reading Number	Reading Reqmt.	Date:	Time:	Charge Current	Charge Voltage	Temperature
1	Initial					
2	1 hour					
3	2 hours					
4	3 hours					
5	4 hours					
6	5 hours					
7	6 hours					
8	7 hours					
9	8 hours					
10	Day 1 #1					
11	Day 1 #2					
12	Day 1 #3					
13	Day 2 #1					
14	Day 2 #2					
15	Day 2 #3					
16	Day 3 #1					
17	Day 3 #2					
18	Day 3 #3					
19	Day 4 #1					
20	Day 4 #2					
21	100 hours					
22	Day 4 #3					
23	Day 5 #1					
24	Day 5 #2					
25	Day 5 #3					
26	Day 6 #1					
26	Day 6 #2					
27	150 hours					
28	Day 6 #3					
29	Day 7 #1					
30	Day 7 #2					
31	Day 7 #3					

PILOT CELL CHARGE REPORT – PAGE 2						
String ID:						
Pilot Cell #		Reading Date and time		Pilot Cell Readings		
Reading Number	Reading Reqmt.	Date:	Time:	Charge Current	Charge Voltage	Temperature
32	Day 8 #1					
33	Day 8 #2					
34	200 hours					
35	Day 9 #1					
36	Day 9 #2					
37	Day 9 #3					
38	Day 10 #1					
39	Day 10 #2					
40	Day 10 #3					
41	250 hours					
42						
43						
44						
45						
46						
47						
48						
49						
50						
51	Final - Before stopping charge					

[END OF SECTION]

SECTION N -- ELECTROSTATIC DISCHARGE (ESD)

CONTENTS PAGE

1. GENERAL

1.1. Introduction

1.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all equipment added, rearranged or modified is properly installed and in conformance with AT&T LEC installation specifications. Refer to ATT-TP-76306 (Electrostatic Discharge Control)

1.1.2 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

1.1.3 This section covers requirements to protect equipment from Electrostatic Discharge (ESD).

1.1.4 Changes in this issue of Section N are summarized in Table N-1.

1.1.5 The term circuit pack is equivalent to terms such as plugs, plug-ins, plug-in units, printed wiring boards, circuit boards, packs, cards, etc.

1.1.6 All equipment containing solid state electronic components is considered ESD-sensitive.

1.2. General Requirements

1.2.1 The Installation Supplier shall provide the necessary anti-static devices to prevent Electrostatic Discharge (ESD) damage to sensitive devices.

1.2.2 Static generating material shall be kept out of work areas where circuit packs are handled.

2. ESD CONTROL HARDWARE - PLACEMENT AND USE

2.1. Wrist Straps

2.1.1 A grounded wrist strap shall be worn at all times when handling a circuit pack that is not inserted in equipment or its protective storage/shipping container. A wrist strap may also be required by an equipment vendor's documentation when performing installation and/or maintenance operations.

2.1.2 To maintain continuity between the wearer's skin and the wrist strap ground point, the band of the wrist strap shall be properly adjusted.

2.2. Wrist Strap Testing and Testers

2.2.1 At minimum, the wrist strap assembly shall be tested each day it is used to assure proper operation. It shall be replaced or repaired when found defective.

2.2.2 The Installation Supplier shall test the integrity of the wrist strap assembly. A Go/No-Go type wrist strap tester using both audible and visual indicators shall be used for testing the wrist strap assembly. In the absence of a wrist strap tester, the wrist strap assembly shall be tested with a volt-ohm meter (VOM). The reading shall be greater than 750 kilo-ohms and less than 1.2 meg-ohms.

2.2.3 When a wrist strap assembly is tested, the band shall be properly adjusted to the wrist, and then the cord shall be stressed from side to side and subjected to a pulling stress to discover intermittent conditions. This dynamic test helps detect open cords or improperly adjusted or dirty bands.

2.3. Wrist Strap Grounding Points

2.3.1 The wrist strap shall be connected to the bay mounted grounding jack, if the bay is so equipped. An alligator clip shall be used to connect a wrist strap to an effective grounding point in equipment not equipped with a grounding jack. Any unpainted screw, nut, bolt, equipment mounting plate, etc., is considered an effectively grounded point. Note: An ESD grounding jack mounted on the manufacturer's equipment shelf may not offer a viable path to the CO ground and shall not be used. A bay or frame mounted jack shall be used.

2.3.2 An ESD jack and label shall be provided on the front of all new equipment racks (right upright at a height of 45" from the floor line, plus or minus 1"). This requirement does not apply to Power Distribution Racks/Bays. Refer to Note 7 of ATT-E-00174-E. Exceptions to this requirement apply to equipment racks that have no accessible space on which to install an ESD jack. The ESD jack shall be electrically continuous with the rack. An ESD jack and label shall be provided on the front of an existing equipment rack upright when specified by AT&T Engineering.

2.4. Static-safe Work Station and Field Service Kit

2.4.1 An ESD Field Service Kit provides a portable static-safe workstation well suited for use at all sites and in CEVs and SLC huts not equipped with ESD protective material. An acceptable kit shall include a wrist strap and cord, a grounding cord, and a static dissipative mat that folds out to create a work surface mat. The mat shall include pouches that can be used as a temporary means to transport circuit packs while not in their protective shipping/storage containers.

2.4.2 A static-safe workstation shall be created and used at any location where personnel will handle bare circuit packs. At minimum, the workstation shall be equipped with a wrist strap assembly, a wrist strap grounding point, and a static dissipative surface on which a circuit pack can be placed. A circuit pack's static-safe shipping/storage container meets the requirement for a static dissipative surface.

2.4.3 Items not allowed at static-safe work stations include:

a) a highly conductive work surface, unless it is covered with a static dissipative material

b) any static-generating material not absolutely required at the work station

3. CIRCUIT PACK STORAGE AND HANDLING

3.1. Circuit Pack Storage

3.1.1 When a circuit pack is removed from an equipment shelf, bank, module, etc., the circuit pack shall immediately be placed in a static-safe container. A circuit pack shall not be removed from its container *except* for installation into equipment or for maintenance at a static-safe workstation (setting option switches, etc.).

3.1.2 A circuit pack storage container shall be one of the following:

a) The circuit pack's original static-safe shipping container

b) An approved third party static-safe container

c) An approved static-safe wrapping

Note 1: While static-safe containers are the preferred method of storage, it is acceptable to store bare circuit packs in an existing circuit pack storage frame or cabinet that is a component of an approved equipment system, such as DMS-100F switches.

Note 2: A number of static-safe transport cases for circuit packs have been approved for use in the AT&T LECs. The purpose of these cases is to transport circuit packs; they shall not be used in place of storage cabinets.

3.1.3 Metal circuit pack storage cabinets shall be grounded. The requirements below are based on the storage cabinets being one or a combination of the following:

a) Any general purpose type metal storage cabinet (wall locker, etc.) that has been braced per applicable storage unit bracing requirements using a metallic angle secured to the wall and/or floor and the top and/or bottom of the cabinet(s), an enclosure that is a component of an approved for use equipment system, or

b) A storage cabinet that has been approved as a stand-alone type (floor support only)

3.1.4 A single circuit pack storage cabinet or a group of cabinets shall be grounded using minimum #6 AWG conductor. This connection shall be made to the common bonding network or the isolated bonding network as applicable.

3.2. Handling and Transportation Guidelines.

3.2.1 While ESD events can affect working equipment, a circuit pack is most vulnerable while not installed in equipment or in a static-safe shipping/storage container. The following guidelines shall be followed to avoid ESD damage:

a) Wear a properly grounded wrist strap assembly before working on or handling circuit packs.

b) Handle a circuit pack by its edge only; avoid touching contacts of the edge connector.

c) Avoid touching the individual components of a circuit pack.

d) Keep the circuit pack in its original shipping container or static-safe protective container until ready for use.

e) When transporting a circuit pack, place it in static-safe cardboard and/or a static-safe plastic bag or use a protective circuit pack container. The container shall be fire retardant if left in an open area or placed on open shelving to meet local fire codes.

f) Never place static generating material, like documents, inside a static-safe container.

g) Store circuit packs on approved suitable shelving. Avoid storing them in equipment bays not specifically designed as a storage area. Circuit packs stored in non-approved shelving and/or bay shall be kept in a static-safe fire retardant container.

h) Unprotected circuit packs shall only be placed on a static-safe work surface in a single layer; circuit packs shall not be placed on top of each other.

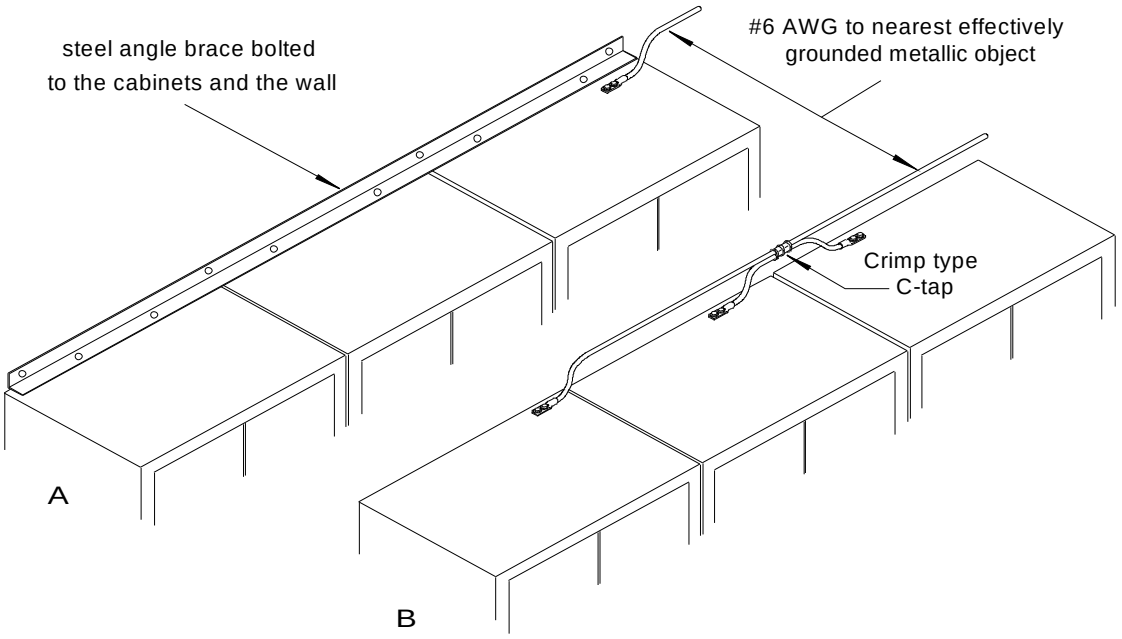
i) A circuit pack shall be accepted only when it is in an approved ESD protective container.

j) Containers are not to be opened unless wearing appropriate wrist strap assembly.

TABLE N-1 – SUMMARY OF CHANGES IN SECTION N

Change	Item in 11/1/05 Issue	Item in this Issue
Revised		
Deleted		
Added		

FIGURE N-1 – TWO METHODS FOR GROUNDING CIRCUIT PACK STORAGE CABINETS



[END OF SECTION]

SECTION O -- FIBER OPTICS

CONTENTS PAGE

1. GENERAL

1.1. Introduction

1.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all equipment added, rearranged or modified is properly installed and in conformance with AT&T LEC installation specifications.

1.1.2 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

1.1.3 This section covers AT&T LEC requirements for running and terminating fiber optic cables and jumpers.

1.1.4 Changes in this issue of Section O are summarized in Table O-1.

1.2. Requirements

1.2.1 The entire length of a polyethylene sheathed fiber optic cable run shall be placed on ladder type cable rack.

1.2.2 The Installation Supplier shall not install innerduct for use with polyethylene sheathed fiber optic cable in the central office environment.

1.2.3 Fiber optic cable troughs also commonly referred to as fiber optic raceway shall not be run through floor penetrations.

1.2.4 Refer to section L, ATT-TP-76300 for Fiber Optic Warning Label requirements.

2. RUNNING, SECURING AND FIRESTOPPING FIBER OPTIC CABLE

2.1. Running Fiber Optic Cable

2.1.1 When the fiber optic cable enters the building in conduit, any slack shall be stored in the cable vault or cable entrance facility area, so that the cable can be pulled back and reterminated or spliced.

2.1.2 Whenever the building has no cable vault, any fiber optic cable slack shall be stored at the entrance facility. The stored length shall not exceed 50 feet. If the fiber optic cable has metallic strength members or a metallic shield, no more than fifty (50) feet of cable shall be pulled into the central office.

2.1.3 When the fiber optic cable is direct buried and does not enter the CO in conduit, it cannot be pulled back and slack shall not be stored in the cable vault.

2.1.4 Fiber optic cable shall be run on cable rack, or dedicated metallic conduit, from the cable vault and/or cable entrance facility to the fiber optic terminating bay.

2.1.5 Fiber Optic Cables (not to be confused with fiber optic patch cords or jumpers) shall not be placed in any fiber raceway/duct work of the fiber protection system. Fiber Optic Cable placements within the Central Office shall be placed on/in dedicated cable rack or metallic conduit and will adhere to merged practice standards as outlined in BSP 800-003-150MP.

2.1.6 All OSP cable entering a building, for more than 50 feet, that is not riser rated shall transition to an approved riser rated cable or a properly fire Stopped metallic raceway prior to leaving the CEF. All exposed lengths of non-riser rated OSP cable entering a CEF within an equipment area shall be wrapped with overlapping layers of aluminum duct tape to protect the cables from exposure to an equipment room fire.

2.1.7 The cable shall not be run on dedicated power cable racks.

2.1.8 The cable shall be run straight on the cable rack and shall not hang off the side or run across an open area.

2.1.9 To avoid the premature exhaustion of available cable space, excess cable of individual fiber optic cable runs shall not be stored on/in the overhead cable rack or raceway.

2.1.10 Fiber optic cable connectors shall be covered and protected with the manufacturer's dust caps during installation.

2.1.11 Fiber optic cables/jumpers shall be installed and/or secured in a manner that protects them from damage.

2.1.12 The Installation Supplier shall utilize cable clamps and grommets to secure all fiber optic cables terminating between Fiber Distributing Frames (FDF) or between FDFs and Network Elements. Clamps and grommets shall be attached to the terminating shelf if there is a designated place on the shelf itself to do so. If there is no designated place on the terminating shelf, then the clamp and grommet shall be placed on the bay upright. Multiple clamps and grommets may be used if necessary to facilitate proper cable slack management. Nine cord may be used as an additional cable securing instrument on the bay upright once the primary clamp and grommet have been placed.

2.1.13 Optical Fiber Non-conductive Riser (OFNR) cable leaving cable racks and entering frames, racks or other equipment shall be supported at least every 3 feet.

2.1.14 When OFNR cable transitions from the horizontal to the vertical plane, a preformed turndown shall be utilized.

2.2. Fiber Optic Cable

2.2.1 On vertical runs, the cable shall be secured at every strap.

2.2.2 Horizontal runs of cable on cable racks shall be secured as necessary to, maintain a straight run, and flow of the bends. The cable shall be secured at points of break off from the cable rack.

2.2.3 Intrafacility cable (IFC) or OSP fiber cables need not be protected due to their protective sheath.

2.2.4 Fiber optic cable shall be secured with two (2) strands of 9 ply polyester twine. A maximum of two cables shall be placed under 1 stitch.

2.2.5 Plastic tie wraps shall not be used to secure fiber optic cable inside the building.

3. FIBER OPTIC PATCHCORDS AND JUMPERS

3.1. Requirements

3.1.1 Fiber optic patch cords shall not be run on cable racks.

3.1.2 Fiber optic patch cords shall be run in dedicated troughs of fiber protection systems. New fiber raceways shall be installed using the AT&T approved fiber protection system. The following requirements apply to the installation of fiber protection systems:

a) Solid-walled raceway shall be used for horizontal runs. The raceway shall be installed with covers where room permits. Covers shall face the ceiling and no side ways mounting of raceway is allowed. Auxiliary framing, conduit, cable racks, etc. shall not obstruct the opening of the raceway covers.

b) Slotted-walled vertical raceway with covers and appropriate elbow sections shall be used on the framework upright between the overhead fiber trough and the equipment break off points. Framework mounted vertical raceway shall be mounted with covers facing the aisle.

c) When connectivity from the overhead ADC Fiber Protection System (FPS) to the top of the network element bay is required i.e. providing a drop option for fiber patch cords, the fibers shall be protected via the use of a rigid arrangement or a corrugated split tube arrangement. Spiral wrap shall **not** be used. The only methods acceptable for drop options with ADC Fiber Protection System (FPS) are either a rigid arrangement or a corrugated split tube arrangement. Examples and details of the rigid and split tube drop option arrangements can be found in ATT-TP-76400, Section 8.

d) Spiral wrap may be used to protect small bundles of individual fibers and to assist in maintaining proper bend radius control when fiber patch cords exit vertical rigid FPS at the front or rear of a bay as the fibers are extended to their connection point within the bay footprint.

e) The fibers jumpers or patch cords shall be protected with two wraps of fiber sheeting if they are secured to the bay or fiber management system on the bay.

3.1.3 At the FDF the fiber protection system (trough) shall be mounted above, beside or below, but not on, the cable rack in the front of the bay. If possible, the fiber protection system shall be mounted at or near to the 7' level. At the network element the fiber protection system shall be on the front of the bay.

3.1.4 Fiber optic patch cords shall not exceed the total required length by more than (10') ten feet. Excess patch cord slack can be stored at either the network element end or the FDF cable management system, depending on space availability, while maintaining the minimum bending radius.

3.1.5 Protective caps shall be placed on the ends of fiber optic jumpers and patch cords during installation, and on the ends of unterminated fiber optic jumpers or patch cords. The protective caps are used to prevent scratching the end of the jumper, which would increase loss and/or cause errors and accidental exposure to laser light.

3.1.6 Vertical portions of the fiber protection system on frame upright shall have support brackets at the top and bottom and every 18 inches between the top and bottom.

3.1.7 In the event an installed Fiber Protection System (FPS) that contains fibers must be cut, the section or sections involved shall be removed from their previously installed position and ALL fibers shall be supported and protected before any cutting can be done.

3.1.8 The cutting of installed Fiber Protection System (FPS) is to be considered "Volatile Work Activity." and shall be performed during the Maintenance Window.

3.1.9 The cutting of installed Fiber Protection System (FPS) shall be outlined in the detailed steps of an approved MOP.

3.1.10 The length of spilt flex tube shall not exceed 18 inches from the horizontal FPS to the top of the bay. If the distance from the horizontal FPS to the bay is greater than 18 inches, the installation supplier shall install rigid vertical FPS from the horizontal FPS to within 18 inches of the top of the bay.

3.1.11 Split flex tube shall not extend more than 3 inches into any fiber management system.

3.1.12 There are no drop length requirements for unsupported patch cords transitioning from the FPS to the network element.

3.2. Fiber Optic Warning Labels

3.2.1 Fiber Optic Warning Labels shall be installed per Section L, ATT-TP-76300.

TABLE O-1 – SUMMARY OF CHANGES IN SECTION O

Change	Item in 11/1/05 Issue	Item in this Issue
Revised		
Deleted		
Added	2.1.12 2.1.13 2.1.14 3.1.10 3.1.11 3.1.12	2.1.12 2.1.13 2.1.14 3.1.10 3.1.11 3.1.12

[END OF SECTION]

SECTION P -- CABLE VAULT AND CABLE ENTRANCE FACILITY

CONTENTS PAGE

1. GENERAL

1.1. Introduction

1.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all equipment added, rearranged or modified is properly installed and in conformance with AT&T LEC installation specifications.

1.1.2 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

1.1.3 This section covers the grounding requirements in the cable vault and Cable Entrance Facility (CEF).

1.1.4 Changes in this issue of Section P are summarized in Table P-1.

1.2. Cable Vault

1.2.1 Each lineup of cable rack in the cable vault shall be equipped with an insulated ground bar near each cable entrance facility (CEF). Refer to Figure P-1.

1.2.2 The insulated ground bar shall normally be mounted above the top horizontal support arms between verticals 2 and 3. As an alternate location, in cable vaults with a single line-up, the insulated ground bar may be mounted on the wall.

1.2.3 All of the ground bars located in the cable vault shall be bonded to each other with a minimum 1/0 AWG conductor to form a grounding system.

1.2.4 The bonding conductor shall be run on the top horizontal and secured every 18 inches with cord.

1.2.5 A 1/0 AWG grounding conductor shall be installed from the central office ground system to the associated cable vault grounding system.

1.2.6 Each lineup of cable rack in the cable vault shall be bonded to the cable vault ground bar with a #6 AWG bonding conductor. Use a two (2) hole crimp type connector, drill the upright, remove the paint and coat contact surface with a thin coat of NO-OX-ID “A”.

1.2.7 Each ST 21 Peth (polyethylene) sheath entrance cable shall be bonded to the ground bar nearest its CEF (maximum 18 cables per bar). The bonding conductor shall be a #6 AWG

conductor equipped with a single hole crimp type lug for connection to the cable splicing case. Lockwashers are required to ensure a secure connection.

1.2.8 Each new or rearranged cable with lead sheath shall be bonded to the ground bar nearest its CEF. The #6 AWG bonding conductor shall be attached to the lead sheath using a B or D bond clip. The bonding clip is normally located between the 2nd and 4th verticals. Connecting a grounding conductor to a lead sheath by soldering on existing cable is not acceptable.

1.2.9 The metallic shield of all cables, including fiber optic, entering a structure shall be bonded to the structure's ground system. In central office cable vaults, this bond is usually made at the point designated as the protection bay.

1.2.10 Foil-lined air pipes shall also be bonded to the nearest CEF ground bar. Airpipe fittings are available for this purpose. #6 AWG bonding conductors shall be used. Several air pipes may be connected together.

1.2.11 Connections to the cable vault ground bar shall be made using two (2) hole crimp type connectors.

1.2.12 All #6 AWG and 1/0 AWG bonding conductors shall be tinned, stranded and insulated.

1.3. Cable Entrance Facility (CEF)

1.3.1 The CEF is considered as the immediate area where the cables enter the building.

1.3.2 The metallic shield of a cable entering a structure shall be bonded to the structure's ground system.

1.3.3 In a CO, remote hut, CEV or customer premise location without a cable vault, an insulated ground bar shall be mounted near the CEF.

1.3.4 A 1/0 AWG conductor shall be installed from the central office ground system to the CEF ground bar.

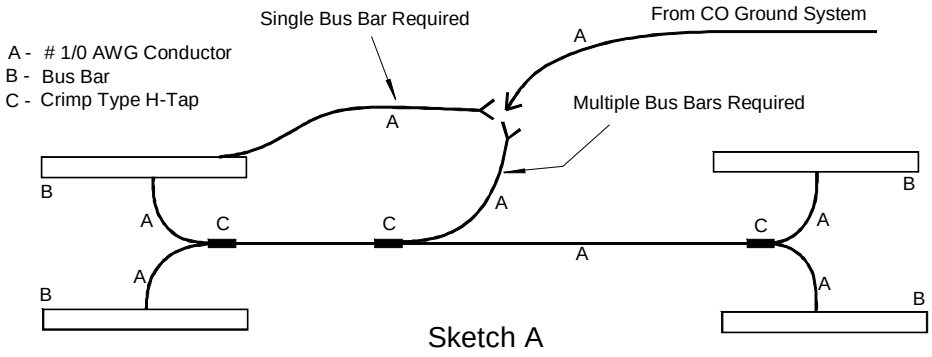
1.3.5 Bond all cables to the CEF ground bar.

1.3.6 Multiple CEFs may be provided in a single building. When this condition occurs, a #1/0 AWG conductor shall be installed to bond all bars together.

TABLE P-1 – SUMMARY OF CHANGES IN SECTION P

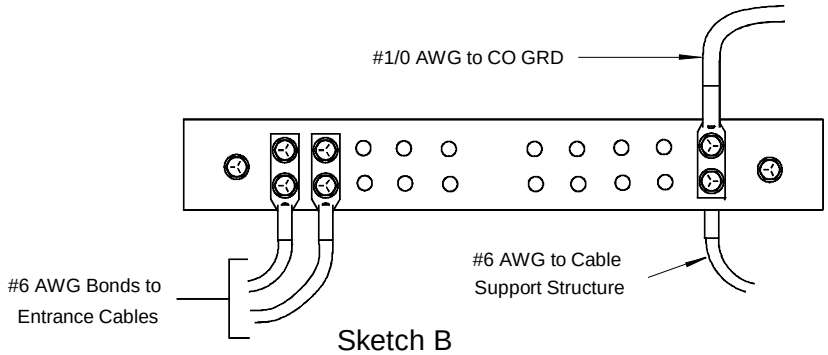
Change	Item in 11/1/05 Issue	Item in this Issue
Revised		
Deleted		
Added		

FIGURE P-1 – CABLE VAULT GROUNDING



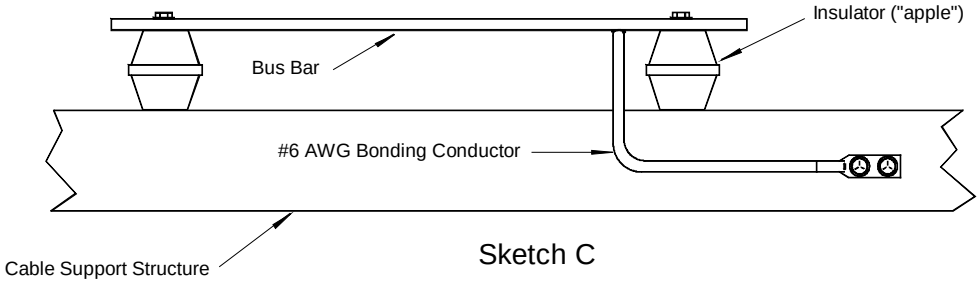
Sketch A

Connections Between CO GRD and the Cable Entrance Facility



Sketch B

10-Position Ground Bar
(one bar required per 18 entrance cables)



Sketch C

Side View - Bus Bar Mounting and Bonding

[END OF SECTION]

SECTION Q -- EQUIPMENT REMOVAL AND CABLE MINING

CONTENTS PAGE

1. GENERAL

1.1. Introduction

1.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all equipment added, rearranged or modified is properly installed and in conformance with AT&T LEC installation specifications.

1.1.2 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications

1.1.3 This section covers the requirements for equipment removal activities.

1.1.4 Changes in this issue of Section Q are summarized in Table Q-1.

1.2. General Requirements

1.2.1 The Installation Supplier shall not remove equipment from service unless authorized by the AT&T LEC Representative.

1.2.2 Removal work shall include an analysis of the central office ground paths. Connectivity to central office ground shall be maintained for frames and bays not being removed. It is the responsibility of the Installation Supplier to maintain the integrity of the central office ground system.

1.2.3 Before removing frames or bays from a lineup, the central office ground shall be temporarily bridged to insure the ground path is not interrupted. The minimum size used for the bridge shall be a #6 AWG stranded conductor.

1.2.4 When the MGB is removed, the Installation Supplier shall maintain ground reference continuity between the battery return of the power plant and Central Office Ground (CO GRD).

1.2.5 Frame and aisle lighting, switches and appliance outlet circuits that are modified or removed will have the AC power removed and the circuit breaker or fuse tagged with an installer created "Warning Tag", before work begins.

1.2.6 After removing fluorescent lighting or outlet circuits, verify that the remaining circuits have the correct polarity and the ACEG is continuous.

1.2.7 Ensure that all junction box holes produced by the removal of conduit etc. are plugged. All remaining, open-ended conduit shall be capped. All junction box cover plates shall be in place.

1.2.8 All through penetrations in fire rated walls and all floors created by removal activities shall be filled with approved fire stoppage products as listed in AT&T-812-000-032.

1.2.9 All record books and designations shall be updated to reflect any revised circuit and fuse assignments, per requirements in Section L.

1.2.10 All designations on equipment remaining in an office associated with removed equipment shall be removed. This includes, but is not limited to, distributing frames, end guards, fuse and power board assignments, and DSX panels.

1.2.11 The Installation Supplier shall coordinate with the trucking, hauling or scrap company, specified in job documentation, or, as instructed by the AT&T LEC Equipment Engineer, to ensure that all scrap materials are properly removed from the job site.

1.2.12 The Installation Supplier shall have at the job site a cable splicing kit capable of splicing 25 pairs of #22, #24 or #26 gauge conductors at one time.

1.2.13 The Installation Supplier shall have personnel experienced in cable tracing and splicing on the job site at all times during cable cutting operations in the vicinity of working equipment.

1.2.14 The Installation Supplier shall have an acid spill kit on site for all battery removal activities.

1.2.15 The Installation Supplier shall ensure that all battery vents and filling tubes are plugged with a shipping plug prior to shipment of batteries containing acid. Also, terminals shall be protected from short circuit with tape, caps, or protective packaging.

1.2.16 The Installation Supplier shall verify (with a clamp-on ammeter) the absence of current for each power lead to be removed. When multiple leads are being removed, the Installation Supplier shall verify the absence of current immediately before removing each lead.

1.2.17 Before the fuse at the power source end of the cable is removed, a clamp-on ammeter shall be utilized to verify the absence of current.

1.3. Alarm Circuits

1.3.1 Verification of all visual and audible central office and building alarms shall be conducted by the AT&T LEC Representative and the Installation Supplier before job start.

1.3.2 Alarm circuits shall be kept operational at all times, unless the current work activity dictates temporary disabling of the alarm circuit.

1.3.3 Any alarms disconnected shall be restored and verified for visual and audible accuracy at the completion of each work shift and when removal operations are completed. Alarm verification shall be confirmed for both central office and building alarms by the remote monitoring location.

1.4. Disconnecting Live Circuits From Service

1.4.1 The Installation Supplier shall verify that the AT&T LEC Representative has made the equipment busy and removed all associated fuses, patch cords, cross-connections, etc., before any removal operation is started.

1.5. Clearing Trouble

1.5.1 If trouble is encountered during removal activity, the Installation Supplier shall notify the AT&T LEC Representative immediately.

1.5.2 It is the joint responsibility of the Installation Supplier and the AT&T LEC Representative to promptly locate and clear service interruptions and circuit troubles.

1.6. Protection Of Working Equipment

1.6.1 The Installation Supplier shall protect working equipment during removal operations.

1.6.2 All materials used for protection shall be anti-static, fire retardant and approved by the AT&T LEC representative.

1.6.3 When extensive equipment removal activities are required, an anti-static, fire retardant sheeting or canvas partition wall shall be constructed and placed between working central office equipment and the equipment removal area to protect working central office equipment from airborne contaminants resulting from removal activity.

1.7. Disposition Of Removed Equipment

1.7.1 All removed equipment shall be disposed of at the direction of the AT&T LEC Equipment Engineer.

1.7.2 The Installation Supplier shall contact the AT&T LEC Equipment Engineer to obtain shipping containers if containers are not specified in the detail specification.

1.8. Use Of Cable Markers

1.8.1 The Installation Supplier shall place a green cable marker on each cable being removed from a bay, unless all the cables associated with the bay are being removed.

2. HAZARDOUS MATERIAL

2.1. General Requirements

2.1.1 Before the removal or shipment of any equipment, the Installation Supplier shall contact the AT&T LEC Equipment Engineer for instructions for the identification and handling of hazardous material.

3. RETIRED IN PLACE

3.1. Requirements

3.1.1 Hazardous material shall not be removed.

3.1.2 All equipment retired in place (RIP) shall be identified by attaching a “RIP” tag or label. (Refer to ATT-002-217-042) Place the RIP labels on the equipment so they do not cover the identifying designations. Stamping or labeling shall be used for marking the following information on the RIP label or tag:

a) Project Number or TEO Number (Leave blank if unknown and retirement occurred prior to 4/1/06.).

b) Date retired in place (Indicate “Prior to 4/1/06” if unknown and retirement occurred prior to 4/1/06.).

c) If the equipment is determined to be reusable and not removed from the office, indicate ‘Reusable Inventory’.

d) If the equipment is determined not to be reusable and not removed from the office, indicate ‘Unusable Equipment’.

3.1.3 The Installation Supplier shall not remove power supply fuses unless authorized by the AT&T LEC Representative in the MOP. The Installation Supplier shall disconnect and remove from the bay all cables associated with the removed fuses and insure disposition is in accordance with the TEO and/or spec.

3.1.4 The Installation Supplier shall install dummy fuses in each vacated open face, GMT and Type 70 fuse position(s).

3.1.5 Switchboard cable and wire terminating on the frame, bay, unit or position shall not be disconnected.

3.1.6 Switchboard cable and wire associated with the far end (i.e., distributing frame, fuse boards, other frames, bays, units or positions, etc.) shall be disconnected.

3.1.7 Vacated frame blocks shall be removed at the distributing frame.

3.1.8 Designations associated with retired equipment shall be removed from partially vacated terminal strips, end guards and DSX panels.

4. REMOVALS

4.1. Removing Frame, Bays And Units

4.1.1 The Installation Supplier shall not remove power supply fuses unless authorized by the AT&T LEC Representative in the MOP. The Installation Supplier shall disconnect and remove from the bay all cables associated with the removed fuses and insure disposition is in accordance with the TEO and/or spec.

4.1.2 The Installation Supplier shall install dummy fuses in each vacated fuse position.

4.1.3 When frames or bays are removed from under auxiliary framing, the auxiliary framing shall be permanently supported at intervals, not to exceed 6′0″. Support shall be provided using 5/8″ threaded rods from the ceiling inserts or from the floor using 2″ pipe stanchions if ceiling inserts are not available. The auxiliary framing shall be level and at the height specified on the cable rack drawing if provided.

4.1.4 The Installation Supplier shall remove all far end wiring terminations associated with equipment being removed.

4.1.5 Opened alarm multiples shall be reconnected.

4.1.6 When distributing frame terminal strips are partially cleared, all wiring and designations associated with the removed circuits shall be removed.

4.1.7 When a frame or bay is removed, the floor fastener (e.g., Loxin, Hilti, etc.) shall not extend above the floor lines. If the floor fastener extends above the floor line, it shall be removed.

4.1.8 If the floor fastener is removed, the hole shall be filled.

4.1.9 The Installation Supplier shall remove the switchboard cable and wire back to the cable rack. If the cable rack is open ladder type, re-secure the cable with cord; if the cable rack is pan type, place the cable on the cable rack. Protecting the ends of dead switchboard cable is not required if the cable is on the cable rack. If the cable ends cannot be stored on the cable rack, the ends shall be covered with heat shrink.

4.1.10 If equipment is to be reused, the Installation Supplier shall:

a) Remove solder wire wrapped connections and excessive solder from rectangular terminals. Remove wire ends, clear wire holes and remove excessive solder from flat terminals.

b) Remove the unit and protect the equipment in a shipping container as specified by the AT&T LEC Equipment Engineer.

c) **Not** remove the hazardous material from the frame or bay.

d) Remove the frame or bay and protect the equipment in a shipping container as specified by the AT&T LEC Equipment Engineer.

5. CABLE MINING

5.1. Introduction

5.1.1 Cable mining is defined as the removal of non-working cable (power, switchboard, armored, etc.) from cable racks (vertical or horizontal) that may be mixed with working cables on the same rack.

5.1.2 Cable mining is an operation with a potentially high risk of service problems, equipment damage, personnel injury and fire hazards.

5.1.3 A bulk cable mining operation involves the removal of a significant number of dead cables from a cable route. A bulk cable mining operation does not imply that all the cables on a cable rack are dead and will be removed.

5.1.4 A dead cable is a cable that has been disconnected at both ends and cut back to a point on the cable rack, as a result of equipment removals, relocations, modifications, etc.

5.1.5 Refer to ATT-TP-76305 and ATT-TP-76305-001 for additional cable mining requirements.

5.2. Requirements

5.2.1 The Installation Supplier shall immediately stop work and notify the AT&T LEC Representative if any of the following job conditions are observed.

a) Sparks, ashes, or other signs of arcing

b) Cables that are warm to the touch

c) Worn, frayed, or damaged insulation on working cables

d) Armored cable.

5.2.2 The Installation Supplier shall exercise care when mining cable not to disturb H-tap covers. If an H-tap cover is opened, it shall be secured at each end with waxed cord.

5.2.3 Cable mining on vertical cable racks between floors where large cables or large amounts of cables are being removed shall be unsecured and removed no more than one floor at a time to prevent excessive unsecured cable hanging weight.

5.2.4 The Installation Supplier shall ensure that remaining cables are placed and secured in accordance with Section J of ATT-TP-76300.

5.2.5 The ends of dead power cables remaining after mining shall be protected with heat shrink caps.

5.2.6 If required, only a nonmetallic cable mining wedge shall be used to separate cables. The wedge shall not be driven between cables; it shall be inserted by hand.

5.2.7 Protection shall be provided for live equipment in the vicinity of cable mining and cutting operations.

5.2.8 Switchboard-type cable shall be cut initially as close to the termination of the cable at the equipment or frame as possible and mined toward its source.

5.2.9 Power cable shall be removed initially between the source protection device and the cable rack before power cable mining starts.

5.2.10 After the initial cut, the Installation Supplier shall cut cable as follows:

a) Pull the dead cable off the cable rack until the cut end is in hand (do not, under any circumstances, cut cable loops).

b) Pass the end of the dead cable through a cable ring cutter and cut. The cable shall be cut not less than 15 inches from the cable rack, with the hanging loose end visible.

c) Make sure the cable does not fall into live equipment.

5.2.11 The Installation Supplier shall remove cables off of the cable rack by hand. Excessive force shall not be used

TABLE Q-1 – SUMMARY OF CHANGES IN SECTION Q

Change	Item in 11/1/05	Item in this Issue
Revised	3.1.2 a) 3.1.2 b) 3.1.3 4.1.1	3.1.2 a) 3.1.2 b) 3.1.3 4.1.1
Deleted		
Added	3.1.2 c 3.1.2 d	3.1.2 c 3.1.2 d

[END OF SECTION]

SECTION R -- PRODUCT CHANGE NOTICES AND MISCELLANEOUS INSTALLATIONS

CONTENTS PAGE

1. GENERAL

1.1. Introduction

1.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all equipment added, rearranged or modified is properly installed and in conformance with AT&T LEC installation specifications.

1.1.2 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

1.1.3 This section covers the requirements for installation suppliers performing Product Change Notice (PCN) and miscellaneous work operations not covered by a specific Telephone Equipment Order (TEO).

1.1.4 Changes in this issue of Section R are summarized in Table R-1.

2. CLASS A/AC PRODUCT CHANGE NOTICES (PCNs)

2.1. Requirements

2.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the product change documentation.

2.1.2 All applicable sections of ATT-TP-76300 shall be observed when applying PCNs, except that use of the Job Start Agreement and MOP shall be negotiated locally.

2.1.3 The Installation Supplier shall coordinate all hardwired class A/AC PCNs that are to be applied to AT&T LEC equipment with the AT&T LEC Representative, to provide the necessary coverage for removing affected equipment from service, testing and restoral of equipment to service. All spare plug-ins shall be modified.

2.1.4 The Installation Supplier shall be responsible for applying any apparatus to the plug-in. After the modification has been completed the Installation Supplier shall apply the new HECI/CLEI barcode label.

2.1.5 The Job Completion Report is not required to report PCN activity only. Instead, the Installation Supplier shall provide the location and quantity of all CLEI changes (old and new), using the Report of PCN Activity form in Figure R-1, to the address provided at the bottom of the form.

3. MISCELLANEOUS WORK OPERATIONS

3.1. Introduction

3.1.1 Miscellaneous work operations include any supplier installation activity performed at an AT&T LEC location that is not covered by a Telephone Equipment Order (TEO) or Product Change Notice (PCN). An example of such work would be when an Installation Supplier had to return to a job site to correct errors discovered during an audit and the TEO had already been closed.

3.2. Requirements

3.2.1 Miscellaneous work operations (e.g., warranty work, engineering complaint orders, defects correction) shall be performed according to all applicable sections of the ATT-TP-76300.

TABLE R-1 – SUMMARY OF CHANGES IN SECTION R

Change	Item in 11/1/05 Issue	Item in this Issue
Revised		
Deleted		
Added		

FIGURE R-1 -- REPORT OF PCN ACTIVITY FORM

A reproducible copy of the Report of PCN Activity form is provided on the next page.

The following report is furnished to allow correction of AT&T LEC records associated with the Product Change Notice (PCN) activity identified below:

REPORT OF PCN ACTIVITY				
Supplier:_____				
Person performing work:_____				
Location (11 character CLLI): _____		**PCN No.**: _____		
MM/DD/YYYY	**CLEI Removed (10 character)**	**CLEI Added (10 character)**	**Quantity**	
			Working	Spare

THIS CONCLUDES THIS REPORT

Forward the completed report to:

Vickie Jefferson (vj6542@att.com)
111 S 3rd AVE, 1st Floor
Madill, OK 73446

[END OF SECTION]

SECTION S -- MARKED DRAWING REQUIREMENTS

CONTENTS PAGE

1. GENERAL

1.1. Introduction

1.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all equipment added, rearranged or modified is properly installed and in conformance with AT&T LEC installation specifications.

1.1.2 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

1.1.3 This section covers the requirements for correcting and updating central office drawings.

1.1.4 Changes in this issue of Section S are summarized in Table S-1.

1.1.5 Additional information on updating central office drawings may be found in Section 4 of ATT-TP-76400.

1.2. Requirements

1.2.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

1.2.2 All installations, removals or assignment changes shall be marked on office base drawings, if applicable, and by electronic application (i.e., Framemate, TAB/db, power database, etc.).

1.2.3 The Installation Supplier shall compare the drawings with the equipment layout and make corrections as necessary so the “final” drawings reflect the actual office layout.

1.2.4 When a drawing is marked or corrected, there are normally one (1) or more associated drawings that also require changes. The Installation Supplier shall correct the affected drawing and ALL associated drawings.

1.2.5 When corrections are required to the drawings, the changes shall be legible and marked in color. Changes to the drawings shall be made as detailed below:

a) **Red** - Additions shall be marked or highlighted in red.

b) **Yellow** - Removals shall be marked or highlighted in yellow.

c) **Green** - New information concerning existing equipment shall be marked or highlighted in green. This indicates a "Record Only" change.

1.2.6 The Installation Supplier shall place one copy of each marked print in the yellow wallet.

1.2.7 When changes to the drawings are required, the affected area shall be outlined in the appropriate color. It is not necessary to color the entire area. For example, an area outlined in red indicates that everything in that area has been added. However, everything possible shall be done to clarify the correction. Small areas (e.g., units mounted in a relay rack, added fuse, etc.) may be completely shaded; bay or circuit numbers may be colored over.

1.2.8 When a small area is outlined, it requires straight lines that define the affected area of equipment; a loose circle that covers part of the adjacent equipment shall not be used. However, large isolated areas may be circled, for example, if a complete bay or frame is being removed from a front equipment drawing, a circle may be used. The whole idea is to mark the drawing so the draftsperson can accurately update the drawings.

1.3. Parameters for Drawing Changes - Additions

1.3.1 Where there is enough space to legibly enter the information, the Installation Supplier shall:

a) Outline the exact area in red.

b) Enter the information.

1. Include locating dimensions.

2. Use symbols to indicate bay sizes.

1.3.2 Where there is not enough space on the drawing to legibly enter the information, the Installation Supplier shall:

a) Select a nearby vacant area.

b) Draw an enlarged outline of the area. Circle the outlined area and draw a line to the intended location on the drawing.

c) Enter the new information in the outlined area.

d) Position the information exactly.

1.3.3 Additions (red) and information (green) shall not be drawn on top of removals or changes (yellow).

1.4. Parameters for Drawing Changes - Removals

1.4.1 When equipment is removed, the affected area shall be outlined or highlighted in yellow.

1.5. Parameters for Drawing Changes - Changes

1.5.1 When equipment is to be replaced, the removal location shall be outlined or highlighted in yellow.

1.5.2 The Installation Supplier shall add the changes (new information and additions) using the rules detailed above for additions. Do not add the new equipment (red) over the removed (yellow) area.

2. DRAWING DETAILS

2.1. Floor Plan Drawing

2.1.1 The Installation Supplier shall show the following information on all updated floor plans:

a) Bay number (inside bay symbol)

b) Bay name on front side of equipment

c) Bay size (length and width - see Symbol Table)

d) Clearance between adjacent bays

e) Distance between bay and columns

f) End guards

g) Aisle number

h) Aisle spacing (front & rear), requirements for equipment lineups are contained in the latest issue of ATT 812-000-003.

2.2. Relay Rack Front Equipment Drawing

2.2.1 The Installation Supplier shall show the following information:

a) Bay sketch with reference to the height and width of the bay, size of mounting plates and supplier (Lucent, Newton, Hendry, etc.)

b) Supplier equipment name or designation

c) Bay number

d) Circuit, shelf , panel, etc. number

e) Name of circuit or unit

TABLE S-1 – SUMMARY OF CHANGES IN SECTION S

Change	Item in 11/1/05 Issue	Item in this Issue
Revised	1.2.2	1.2.2
Deleted		
Added		

[END OF SECTION]

SECTION T -- SYNCHRONIZATION

CONTENTS PAGE

1. GENERAL

1.1. Introduction

1.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all equipment added, rearranged or modified is properly installed and in conformance with AT&T LEC installation specifications.

1.1.2 The Installation Supplier shall assure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

1.1.3 This section covers the requirements for wiring in a manner to assure compliance with the AT&T synchronization rules and policies.

1.1.4 Changes in this issue of Section T are summarized in Table T-1.

2. REQUIREMENTS

2.1. General

2.1.1 The Installation Supplier shall attach a sync assignment record book to the bay upright at or near the BITS/TSG clock. The Installation Supplier shall perform all cable labeling operations, update sync assignment record book and match assignments updates in TAB/dB for all installations, rearrangements and removals.

2.1.2 Refer to Section J, ATT-TP-76300 for cabling requirements.

2.1.3 Refer to Section L, ATT-TP-76300 for labeling requirements.

2.1.4 Refer to Section K, ATT-TP-76300 for connecting requirements.

2.2. Building Integrated Timing Supply (BITS)

2.2.1 Building Integrated Timing Supply (BITS) concept is the method of providing intraoffice synchronization. That BITS plan specifies that each office shall have one master clock signals source called the BITS/TSG. Under the BITS concept, every timing capable digital Network Element in the office shall derive its timing DIRECTLY from that single source within the office. A timing capable Network Element is defined as any digital network equipment piece that is able to conform to the BITS concept by accepting the appropriate timing signals from an external source. A Network Element is still timing capable even if it is not currently configured or equipped to accept external timing signals, as long as the option so exists to allow it to be so equipped.

2.3. Synchronization Requirements

2.3.1 The installation supplier shall wire every timing capable network element within a building directly from the BITS clock. This timing shall NOT be wired through any intervening devices, other than BITS clock equipment. The Installation Supplier shall NOT run the timing leads from BITS clock OUTPUTS to the network elements input through DSX jacks unless specifically instructed to do so in the detailed specification.

2.3.2 Any Network Primary Reference Source (PRS) shelf shall be mounted in the same with or an adjunct/adjoining bay to the master shelf. The installation supplier shall contact the AT&T LEC Equipment Engineer if the detailed engineering specifications contain instructions for mounting this equipment in any other manner.

2.3.3 The AT&T LEC Equipment Engineer shall be contacted in the event of BITS DS1 output signals or DS-Zero/composite clock signals approaching 80-90% exhaustion.

2.4. Diversity And Redundancy

2.4.1 Redundant BITS (timing) clock input and output leads and any other leads requiring diversity or redundancy shall be routed via separate cable paths when and where possible.

2.4.2 Redundant BITS clock leads may be routed on a common cable rack when/where multiple cable paths are not possible as follows:

a) Redundant leads shall be placed on opposite sides of the rack to the point they can take separate cable paths. For ladder type cable racks, the cables shall be secured every third strap. When panned cable racks are provided, the cable shall be loosely tied to the inside of the cable rack stringer or the cable rack horn every six feet

b) One pair/set of redundant leads associated with CCS7 equipment and Composite Clock/DS-Zero feeders between the master BITS clock, and remote master BITS/TSG shelves shall be placed in innerduct for the distance the leads are run parallel on the same rack (timing leads may share a common innerduct when space permits), and

c) Innerduct shall be of the fire-retardant, solid (un-split, unless split is specified) corrugated design having a maximum 1.25-inch diameter and shall be riser rated (minimum). Innerduct protected runs are for critical service cables protection rather than cables

identification. The AT&T approved red jacketed 1175A sync dedicated cable provides the distinctive identification of sync associated input and output cables.

2.4.3 When/where redundant leads must pass through a common cable hole, their cable routes shall be via separate cable routes up to the cable rack entering the hole, and via separate cable routes as soon as possible after exiting the hole on the other side.

2.4.4 Redundant BITS clock input and output leads shall not cross at any point along their respective routes.

2.4.5 Redundant leads within equipment frames shall be routed on opposite sides of the frames.

2.5. Output Cabling Requirements

2.5.1 The timing leads from BITS clock OUTPUT ports to a network element shall be run using the approved red-jacketed shielded cable (currently type 1175A cable).

2.5.2 The Installation Supplier shall connect (DC/hard grounded) the shield/drain wire at the clock source end only (unless specified by the equipment vendor as electrically part of the circuit). NOTE: The shield/drain wire shall NOT be connected via a DC/hard grounded termination at the network element. Unless otherwise specified on a AT&T Standard Drawing, connection of the shield/drain wire at the network element shall be in accordance with the manufacturer's instructions. This may include leaving the lead unterminated or AC-coupled through an appropriately sized capacitor. When the network element manufactured cables do not meet this condition, the detail engineer shall be contacted for further instructions.

2.5.3 The Installation Supplier shall NOT run the timing leads from the BITS clock OUTPUTs to the network element input(s) through DSX jacks unless specifically instructed to do so in the detailed specification.

2.5.4 When instructed by the detailed specification to wire the BITS OUTPUT through a DSX jack and cross-connect field to the network element DSX jack, the Installation Supplier shall select the network element jack that is as close as possible to the modified sync jack. The DS1 output of the BITS shall be connected to the OUT jack, hardwired side of the DSX jack. The (IN) jack shall be terminated with a 100 ohm resistor. (See Figure T-4)

2.5.5 At the network element or DSX jack appearance, the sleeve/drain ground wire of the approved cable shall be insulated with spaghetti sleeving (Protective Tubing R-4563/C401-652-078).

2.5.6 Where/when the Installation Supplier is instructed to select the BITS clock termination points, all critical network element timing signals lead termination points shall terminate only on the BITS/TSG office master shelf or one of its expansion shelves or a DCD Remote Master shelf equipped with Remote Track and Hold Cards (RTHC). Critical network elements are defined as:

a) All CCS7 related equipment (STP's, LPP's, FLIS, LIM, IDST, SECURE7, and D4 bays serving SS7 Links).

b) Slave/Remote master clock shelves.

c) Any other equipment specified by the AT&T LEC Equipment Engineer or detail engineer as being "critical."

2.5.7 The Installation Supplier shall wire all redundant timing signals leads from BITS clocks as mated pairs, odd and even assignments within a shelf. Outputs shall be equally assigned between each matched set of cards such that both cards will be exhausted at the same time period.

2.5.8 Redundant output timing signal feeders from new or vacant card slots shall be routed from alternate sides of the BITS shelf, thereby splitting the total shelf output complement in half, as viewed from the rear or wire-wrap output field of the BITS/TSG shelf.

2.5.9 Redundant output timing signals feeders from new or vacant card slots shall be wired to associated pairs of output card slots utilizing the following or similar pair scheme, thereby reinforcing diversity of output assignments and terminations.

2.5.10 At the rear of the BITS shelf, the Installation Supplier shall butt and strip the cable sheathing in such a manner as to not allow cable sheathing to be placed on the fanning strip or within the rear protective cover of this strip. The butts shall be protected with heat shrink tubing only and spaghetti sleeving shall be placed on the sleeve lead (ground wire). Tape shall not be used at any time for this application.

2.5.11 All alarm and alarm return leads shall be run as pairs as specified by the job documentation.

2.5.12 Alarms shall be wired, verified and tested as specified in the detailed specification and other sections of ATT-TP-76300

2.5.13 All terminations at the network elements shall be dressed with heat shrink insulation.

2.6. Input Cabling Requirements

2.6.1 If used, the Installation Supplier when instructed by the detailed specification shall wire all input signals timing references to the BITS clock through modified DSX sync jacks or MINI-DSX in the BITS bay. If the BITS clock is not within DSX line-up, the cabling shall be diversely routed.

2.6.2 All sync jacks, if used, shall be equipped/identified with appropriate markers indicating SYNC. These markers shall include the modified DSX jack, the originating facility jack and the terminating network element jack, if necessary.

2.6.3 The appropriate sync DSX jack schematic (see figures) shall be used. The schematic within the manufacturer's BITS clock documentation shall be marked as void and shall be replaced with the actual schematic utilized.

2.6.4 For reference, the timing references, provided by the AT&T LEC Equipment Engineer, are shown in Figures T-1 through T-4.

2.7. Power Requirements

2.7.1 Dedicated BITS fuse panel(s) shall serve only BITS equipment in the same or its adjunct/adjoining bay

2.7.2 Battery and battery return leads from the BITS/TSG dedicated fuse panel(s) shall be cable tagged and routed down opposite sides of the equipment bay. "A" and "B" battery outputs of the fuse panel(s) shall be wired in a manner to correspond to the "A" and "B" battery inputs of the BITS equipment. This may require the mounting of two wire support brackets, one above and one below the fuse panel.

2.7.3 Both "A" and "B" battery and battery return leads from the BDFB to the added BITS and/or BITS fuse panel(s) shall have diverse routing.

2.7.4 All battery and battery return connections from the fuse panel(s) to the BITS equipment shall be made with ring terminals at both ends.

2.7.5 Battery and battery returns to the BITS dedicated fuse panel(s) shall originate from separate BDFBs where multiple BDFBs are currently provided on the same floor; or from diverse load supplies and returns on single floor BDFBs.

2.7.6 Battery and battery returns to the BITS dedicated fuse panel(s) that originate directly at the Power Plant shall be fused on different rows.

2.8. Grounding Requirements

2.8.1 Clock shelf chassis (frame) ground and logic/signal ground leads shall be individually run and properly terminated.

2.8.2 The sleeve/drain wire from the approved signal cable shall be insulated with spaghetti-type sleeving

2.8.3 If the timing lead to/from a network element within an isolated ground plane has an intermediate DSX appearance, the shield/drain shall be grounded at the network element and at the BITS clock, but left unterminated at the intermediate DSX. If the lead does NOT have a DSX appearance, the shield/drain shall be grounded at the Signal Source, network element end only.

2.8.4 When/where a shield/drain ground connection is required, verify that the ground termination pin/point is DC-grounded and not AC capacitive-coupled/grounded through a capacitor (GR-1244, R3-9).

2.9. Cabling Requirements For SONET

2.9.1 SONET terminal/ADM equipment configurations requiring BITS timing shall be individually timed from the office BITS, with primary and secondary DS1 feeder references from adjacent T1 (DS1) output cards, with odd-even slot assignments per AT&T interconnect drawings. The Installation Supplier shall NOT daisy chain these timing lead to enable cascading of synchronization to all terminals within a bay framework. In the event of output ports exhaust, arrangements shall be made with the AT&T LEC Equipment Engineer to install additional BITS clock outputs; all other TSG outputs shall be cabled to separate card assignments.

2.9.2 Each SONET terminal/ADM shall have the "CLOCK IN" connections (PRIMARY and SECONDARY) cabled via the approved 22 AWG single pair shielded cable, type1175A, (or approved equivalent) to the BITS. Shield/drain lead conductors of all SONET sync input cables shall be DC-grounded at the BITS shelf only and left unterminated and insulated at the SONET terminal/ADM connector.

2.9.3 The BITS "CLOCK OUT" signals shall be cabled to the SONET network element "CLOCK IN" signals connection.

2.9.4 The network element "CLOCK OUT" connections (PRIMARY and SECONDARY) shall not be cabled; except when required for office BITS clock reference. These connections should be available on separate wirewrap pins from the "CLOCK IN" connectors terminating on the network element. (GR-1244, R3-10).

2.9.5 The External Clock Wire Wrap (ECWW) adapter kit or equivalent are the preferred method of clock timing leads terminations to a DB9 connector (GR-1244, R3-10).

2.10. Removals

2.10.1 At the BITS/TSG, the Installation Supplier shall remove and lay back all terminations associated with removed and/or displaced network elements.

2.10.2 The Installation Supplier SHALL verify all input/output timing leads before they are disconnected as follows:

a) First, verify and confirm the presence of far end ground on the unterminated shield/drain wire at the network element.

b) Second, identify the cable at the BITS clock end and remove the shield/drain wire.

c) Third, confirm/verify loss of ground on the shield/drain wire at the network element being removed. If ground is lost, the cable shall be disconnected at the BITS clock and the network element, in that order.

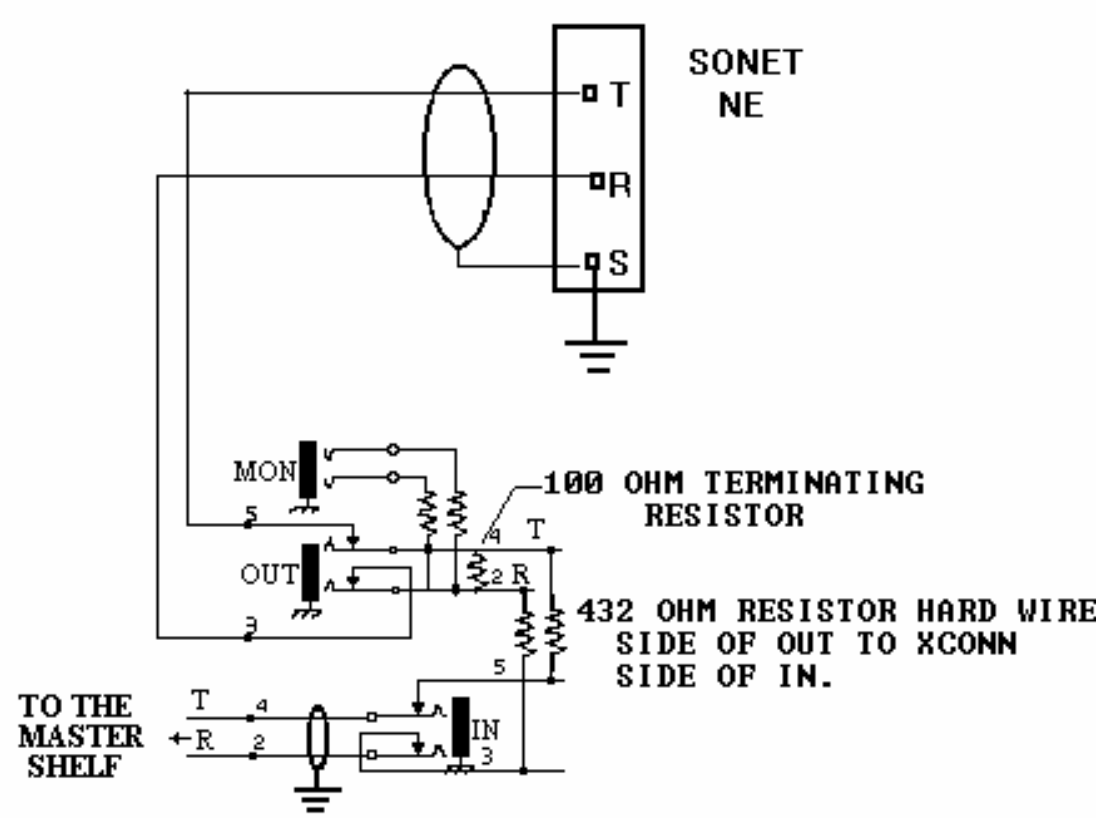
d) If ground remains after the shield/drain wire is removed at the BITS clock, an incorrect cable has been identified and the shield lead shall be reconnected. To identify the correct leads, the Installation Supplier shall trace the timing leads from the network element to the BITS clock.

e) Complete all cable removal operations, update sync record assignment book and assure all updates match and are reflected in TAB/dB.

TABLE T-1 – SUMMARY OF CHANGES IN SECTION T

Change	Item in 11/1/05 Issue	Item in this Issue
Revised	2.5.4	2.5.4
Deleted		
Added		

FIGURE T-1--SCHEMATIC OF SYNCHRONIZATION JACKS USING SONET REFERENCED SIGNAL

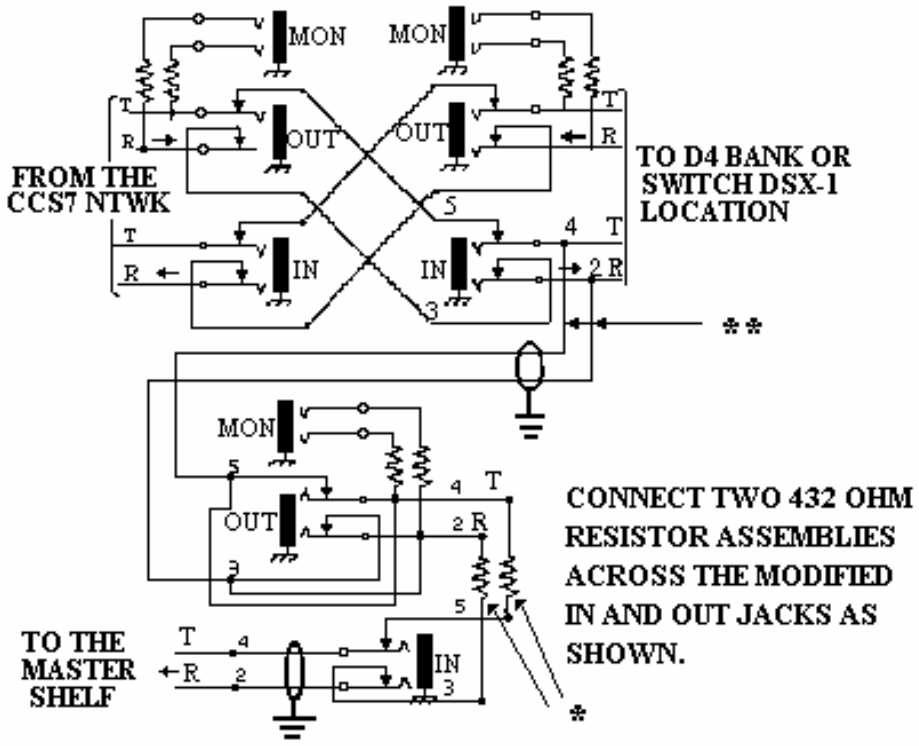


INPUT LEVELS INTO THE DCD SHELF SHALL BE *LESS THAN* .3V FOR BRIDGED INPUT OR *MORE THAN* 1V FOR TERMINATED INPUT.

VOLTAGES SHALL BE MEASURED WITH AN OSCILLOSCOPE

SHIELD TERMINATION FROM DSX TO THE BITS ARE REQUIRED. DCD-523 REFER TO NOTE 55 IN INTERCONNECT DRAWING FOR TERMINATION. DCD-ST2 AND DCD-400 SHELVES REQUIRE AN EXTERNAL GROUND SOURCE.

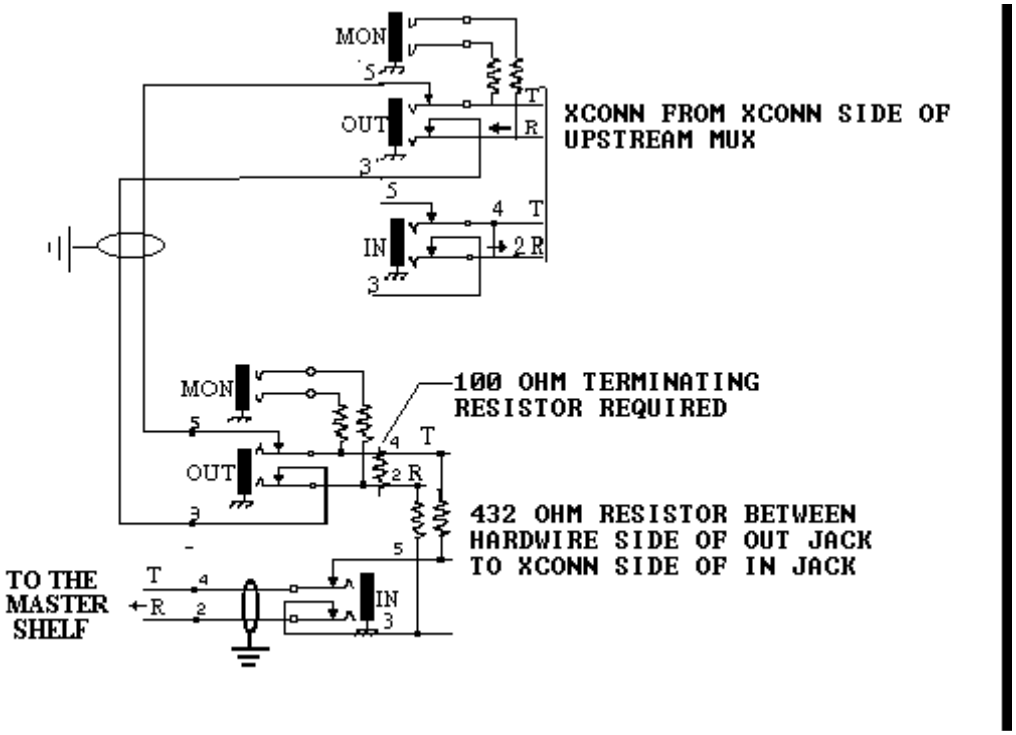
FIGURE T-2--SCHEMATIC OF SYNCHRONIZATION JACKS USING CCS7 REFERENCED SIGNAL OR TRAFFIC BEARING T1 SPAN



* For locations where the DSX line-up is less than 5 bays and the Sync Jack is located in the middle bay. If this condition is not met, these resistors shall be replaced with a strap.

** When the DSX line-up is more than 6 bays or the length of these leads exceed 15 feet, the resistors shall be connected between the hardwired side IN jack of the D4 bank jack and the OUT jack of the modified Sync. jack.

FIGURE T-3--SCHEMATIC OF SYNCHRONIZATION JACKS USING DEDICATED T1 SIGNAL FROM UPSTREAM OFFICE



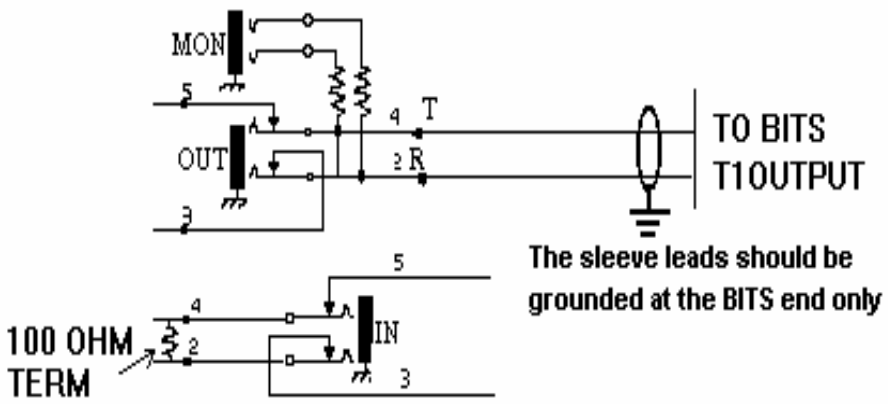
INPUT LEVELS INTO THE DCD SHELF SHALL BE *LESS THAN* .3V FOR BRIDGED INPUT OR *MORE THAN* 1V FOR TERMINATED INPUT.

VOLTAGES SHALL BE MEASURED WITH AN OSCILLOSCOPE

SHIELD TERMINATION FROM DSX TO THE BITS ARE REQUIRED. DCD-523 REFER TO NOTE 55 IN INTERCONNECT DRAWING FOR TERMINATION. DCD-ST2 AND DCD-400 SHELVES REQUIRE AN EXTERNAL GROUND SOURCE.

INSTALLER SHALL CABLE ORIGINATING OFFICE TIMING LEAD FROM THE BITS CLOCK TO THE FACILITY MUX. LOCAL TECHNICIANS WILL TERMINATE ON THE MUX AND TURN UP THE SPAN.

**FIGURE T-4--SCHEMATIC OF SYNCHRONIZATION JACK
(INPUT TO NETWORK ELEMENT)**



[END OF SECTION]

SECTION U -- STANDBY ENGINE/ALTERNATOR SETS

CONTENTS PAGE

1. GENERAL

1.1. Introduction

1.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all equipment added, rearranged or modified is properly installed and in conformance with AT&T LEC installation specifications.

1.1.2 The Installation Supplier shall assure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

1.1.3 This section covers the general requirements for the installation of stand-by engine/alternator sets.

1.1.4 Changes in this issue of Section U are summarized in Table U-1.

1.1.5 For more detailed information refer to BSP 790-100-658JP and BSP 790-100- 658MP

2. REQUIREMENTS

2.1. General

2.1.1 All exterior engines and associated support equipment shall be protected by bollards, covers, or other protective obstructions to prevent damage from vehicles or other traffic.

2.2. Exhaust Requirements

2.2.1 Exhaust piping and duct connection joints shall not be insulated until full load testing has been completed and the bolts have been re-tightened.

2.2.2 Exhaust piping shall have a flexible section installed within 12″ of the engine/alternator set manifold. All flexible metallic conduit shall have a #6 AWG continuity bond across the flex section.

2.2.3 All exhaust components exposed to outside elements (module or building) shall be stainless steel.

2.3. Alarms

2.3.1 The Installation Supplier shall extend and terminate all specified alarm leads as designated by the AT&T LEC Equipment Engineer. The terminal blocks shall be stenciled per Section L.

2.3.2 All new standby engine/alternator sets shall have the capability of forwarding alarms via TCP/IP to the appropriate alarm center. The alarms specified shall be the AT&T minimum alarms per AT&T drawing ATT-P-05010-E.

2.4. Grounding

2.4.1 All grounds shall be ultimately connected to the central office ground system.

2.4.2 The standby engine/alternator set control cabinet shall be grounded to the alternator frame with a flexible braided strap in accordance with BSP 790-100-658MP, *Standard Specification and Performance Requirements for Engine/Alternator Sets*.

2.4.3 The standby engine/alternator set control cabinet shall have an #6 AWG ground lead terminated with a two-hole crimped lug and be tagged.

2.4.4 When multiple parallel conduits are used a full sized grounding conductor shall be run in each conduit.

2.4.5 Equipment grounding conductors shall terminate within the engine/alternator cabinet provided for termination of phase conductors. Termination shall be made directly to a non-insulated ACEG bus bar.

2.4.6 To provide grounding continuity between the entire engine/alternator set and the equipment grounding conductors, the engine/alternator cabinet shall be electrically connected to the set frame in one of the following manners:

a) By attachment hardware

b) By a bonding strap of cross-sectional area equal to that of the grounding conductor specified.

2.5. Connections

2.5.1 All field wire and cable connections #10 and larger shall be made using compression type copper connectors manufactured by T&B or Burndy. The finished crimp shall be circumferential. The crimping tool or dies shall emboss the crimped connection in such a way that it may be easily identified for correct tool embossment.

2.5.2 The installation vendor shall provide means to prevent field-installed connectors from turning at termination points.

2.5.3 The standby engine/alternator set output leads (either single or three phase) shall be connected to the transfer switch, Building AC or within a junction box termination point in the following manner.

a) The correct compression type splice connector shall be utilized when the conductors between the alternator and AC transfer switch are spliced or directly joined together.

b) Two-hole compression terminals may be utilized with a bus bar arrangement in the junction box or AC transfer switch when this arrangement is specified.

c) The split bolt type connectors, sometimes called kearnies, shall NOT be used.

d) The splice or junction box shall not be mounted on the emergency, engine/alternator set mounting assembly due to vibration.

2.6. Fuel System

2.6.1 Fuel systems shall meet all local, state and federal permitting requirements.

2.6.2 The installation of all fuel systems shall be reviewed by AT&T Environmental Management.

2.6.3 Engine/alternator set fuel lines that are located outside the central office and exposed shall be protected from being crushed.

2.6.4 Both the fuel and return lines shall have flexible sections connected to the engine/alternator set.

2.6.5 All field installed fuel hoses shall be of proper length without any looping, sharp bends or excessive slack.

2.6.6 All engine/alternator set fuel piping shall meet the following criteria:

a) All fuel piping from the engine/alternator to the day tank shall be that stipulated within the Engine/Alternator Data Sheet.

b) Pipe sealant such as Gasiola red, shall be used on all fittings.

2.6.7 Day tanks shall be equipped with spill containment dams of adequate capacity to contain the contents of the day tank.

2.6.8 Day tanks of metallic construction shall have a #6 AWG stranded and tinned grounding conductor terminated with one 2-hole compression connector and extended to the CO grounding system.

2.6.9 Any time the fuel system (i.e., Piping, day tank, fuel storage tank, etc.) from the standby engine/alternator set to any fuel tank supporting the engine/alternator set requires work, the Installation Supplier shall contact the Environmental Management Control Center (EMCC) before beginning work.

- The EMCC can be contacted at 1-(866) I WANT EM / 1 (866) 492-6836

2.7. Guards, Labels and Nameplates

2.7.1 All phase leads between the engine/alternator set and the control board shall be marked showing the phase rotation.

2.7.2 All piping shall be directionally labeled and isolation valves shall be position labeled.

2.7.3 All exposed surfaces with temperatures greater than 45° C / 113° F shall be marked with warning labels. Surfaces with temperatures greater that 60° C / 140° F shall be guarded as well as marked with warning labels. Non-asbestos insulation and/or ventilation guards shall be provided to protect the operator from accidental contact with the engine/alternator set exhaust system parts and piping or any other components with surface temperatures higher than 60° C / 140° F.

2.7.4 Suitable guards that meet OSHA requirements shall be provided to protect any operator from being harmed by fans, blowers, rotating parts of alternators and any other moving parts associated with the engine/alternator set to which the working personnel may be exposed.

2.7.5 All setscrews, bolts, keys or keyways shall have no projecting or sharp edges or be suitably guarded. All in-running gears and sprockets shall be completely enclosed or provided with band guards around the face of the gear or sprocket. Working personnel shall not be able to touch any rotating part.

2.7.6 The engine/alternator set AC panel shall have the power source labeled clearly.

2.8. Testing and Acceptance

2.8.1 The Installation Supplier shall verify the availability of lubricating oil and permanent antifreeze required for standby engine/alternator sets.

2.8.2 The Installation Supplier shall verify that the engine/alternator contains the proper levels of lubrication oils and water/antifreeze mixture before the initial test run.

2.8.3 All personnel working in the vicinity of operating engine/alternator sets shall wear ear protection.

2.8.4 The engine/alternator set shall not be started until a manufacturer's representative has performed the initial start-up.

2.8.5 The Installation Supplier shall provide resistive type load bank(s) and connection cables capable of absorbing 110 % of the engine/alternator's rated output in kilowatts during the on site load testing.

2.8.6 The Installation Supplier shall provide a representative to assist the AT&T LEC personnel in acceptance testing.

2.9. Batteries

2.9.1 Anti-corrosion coating such as NO-OX-ID-A shall be applied to all battery terminals and connections.

2.9.2 All battery cables shall be secured to prevent chaffing.

2.9.3 The engine/alternator set start and control batteries shall be located so the cells are not exposed to excessive heat.

2.9.4 All batteries shall be contained in an appropriately grounded rack or other acceptable container.

2.10. Radiator

2.10.1 Any radiator not located on the engine/alternator skid shall comply with all 'remote' radiator requirements.

2.10.2 Radiator piping and AC conduit shall not be supported by the radiator stand.

2.10.3 All radiator piping shall be painted with a high temperature outside paint.

2.11. Emergency Shut Down

2.11.1 The emergency shutdown switch for the engine shall be designated and covered to prevent accidental activation.

TABLE U-1 – SUMMARY OF CHANGES IN SECTION U

Change	Item in 11/1/05 Issue	Item in this Issue
Revised		
Deleted		
Added		

[END OF SECTION]

SECTION V – HAZARDOUS MATERIALS AND WASTE MANAGEMENT

CONTENTS PAGE

1.0 GENERAL

1.1 INTRODUCTION

1.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all equipment added, rearranged or modified is properly installed and in conformance with AT&T LEC installation specifications.

1.1.2 The Installation Supplier shall assure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications

1.1.3 This section covers general requirements for hazardous materials and waste management in AT&T sites.

1.1.4 The information in this section is not intended to be an all-inclusive guide. It is intended to provide an awareness of the types of hazardous materials that may be present in AT&T sites.

1.1.5 Proper handling and management of hazardous materials and waste is necessary to

a) Protect AT&T employee and installation supplier's health

b) Protect public welfare, and

c) Maintain AT&T's corporate objective to conduct, manage and maintain its operation in compliance with environmental laws and regulations with full regard to their potential impact on the environment and the community.

1.1.6 Compliance with environmental laws and regulations is the responsibility of every person working in an AT&T facility.

1.1.7 For guidance regarding hazardous materials and wastes management the AT&T LEC Representative can refer to the Environmental Management web site, http://em.sbc.com, or contact the AT&T Environmental Management office at 1-866-I-WANT-EM (1-866-492-6836).

1.1.8 Changes to this issue of Section V are summarized in Table V-1.

2.0 DEFINITIONS

2.1 Hazardous Materials are useable materials that exhibit one or more hazardous characteristics – corrosivity, ignitability, reactivity or toxicity (e.g. acid and alkaline batteries, fuel, engine fluids, central office switch components containing mercury and/or PCBs boiler chemicals, fluorescent bulbs).

2.2 Hazardous Wastes are materials that exhibit hazardous characteristics described above and are no longer useful or valuable to its owner (e.g. spent batteries, leaking batteries, mercury and/or PCB central office switch components that are to be disposed).

3.0 REQUIREMENTS

3.1 GENERAL

3.1.1 The Installation Supplier shall adhere to all federal, state and local regulations regarding hazardous material/waste in addition to AT&T LEC installation requirements.

3.1.2 The Installation Supplier shall be responsible for compliance with federal, state and local environmental regulations.

3.1.3 The Installation Supplier shall employ environmentally safe practices in the performance of their duties.

3.1.4 The Installation Supplier shall obtain the necessary environmental permits (e.g. standby engine permits), notifications (e.g. notification of regulating agency and Environmental Management) and training (e.g. Floor Drilling training) prior to the initiation of work activities.

3.1.5 The AT&T LEC Representative shall direct the Installation Supplier regarding hazardous materials and waste management prior to, during and after completion of work activities.

3.1.6 The AT&T LEC Representative shall adhere to guidelines and procedures established by AT&T Environmental Management, available on the Environmental Management website, http://em.sbc.com, or contact the AT&T Environmental Management office at 1-866-I-WANT-EM (1-866-492-6836).

3.1.7 The Installation Supplier shall coordinate with the AT&T LEC Representative before starting any activity related to hazardous material/waste.

3.1.8 Only vendors approved by AT&T's Environmental Management organization shall handle, remove, package, purge, transport or dispose of hazardous waste.

3.1.9 In the event of any of the following occurrences, the Installation Supplier shall immediately contact the AT&T LEC Representative who will contact the appropriate AT&T organization:

Type of Occurrence	AT&T LEC will contact…
• Regulatory agency inspector visit to site • Accidental release/spill of hazardous material or waste	AT&T Environmental Management : **1-866-I-WANT-EM (1-866-492-6836)**
• Accidental exposure to workers	AT&T Corporate Safety : **1-866-SBC-SAFE**

3.2 HAZARDOUS MATERIALS AND WASTES

3.2.1 Installation Suppliers often handle hazardous materials in the course of their work activities. Handling of hazardous wastes requires specialized training and knowledge. Therefore hazardous wastes are managed only by Environmental Management approved vendors.

3.2.2 The following hazardous materials, not to be considered inclusive, may be encountered in AT&T facilities:

Hazardous Material	Typical Environment Encountered
Asbestos	Floor tile, cable holes and covers, cable sheath, ceramic resistor washers, asbestos textiles, asbestos sheets, generator, boiler insulation and transit ducts
Arsenic Trioxide	Cable Sheath around older cables
Electrolyte (battery acid/alkali)	Wet-cell, gel cell, Ni-Cd batteries
Lead	Lead Sheath, solder and paint wastes
Mercury	Switches, relays, tubes and interrupters. These may be frame mounted, plug-in units or mounted on plug-in circuit boards, fluorescent light tubes
Petroleum Products	Fuel for emergency power generating equipment and in lubricating fluids and solvents
Polychlorinated Biphenyls (PCBs)	Capacitors, power supplies, frequency generators, motor driven interrupters, fluorescent light ballasts and oil filled transformers
Radioactive Materials	Cold cathode tubes, fire detectors, emergency exit signs, vacuum tubes
Compressed Gases	Gases like nitrogen may be found in cable vaults, non-empty (pressurized)aerosol cans, MAPP Gas cylinders and propane cylinders.

3.2.3 Installation Supplier shall issue appropriate warnings to, inform and educate its employees, agents, subcontractors, other invitees, and the employees of any of them, entering AT&T facilities of the above information in accordance with applicable laws and regulations.

3.2.4 When equipment containing hazardous material (e.g. 1-AESS switches, transformers, rectifiers, relays, etc) is moved between AT&T facilities, the Installation Supplier shall notify Environmental Management through the AT&T LEC Engineer prior to transportation to ensure compliance with environmental regulations.

3.2.5 Equipment containing hazardous material that is removed during routine maintenance and repair shall be segregated and stored in appropriate and properly labeled containers and Environmental Management contacted to assist with proper disposal using an AT&T Environmental Management approved-vendor.

3.2.6 If equipment contains components that contain hazardous material, such components are considered hazardous waste when the equipment is determined to be of no additional use. Before the Installation Supplier removes equipment that is to be sold as scrap, the Installation Supplier shall contact the AT&T

LEC Equipment Engineer to have all equipment components containing hazardous material identified and removed. The Installation Supplier shall not remove such hazardous components unless the Supplier is an AT&T Environmental Management-approved vendor.

3.2.7 An Installation Supplier shall not transport or dispose of hazardous materials or waste unless the supplier is an AT&T Environmental Management approved-vendor.

3.3 Shipping Batteries for Removal or Reuse

3.3.2 When batteries are removed for non-reuse, procedures described in section V shall be followed.

3.3.3 Batteries staged for reuse shall be prepared for shipment as noted below. Cells shall be marked and reinstalled in the same order as placed in the original installation. Miscellaneous battery items such as spark arrestors and thermometers shall be packed and stay with the cell in which they were originally installed.

3.3.4 Vents shall be covered with a shipping cap.

3.3.5 Filling tubes shall be plugged and terminals shall be protected against short circuits with tape, caps or protective packaging.

3.3.6 Each container or unit shall be marked with proper identification and address of the assignee and consignor. Also a 4" x 4" label, with the word "corrosive" shall be applied to each container or unit.

4.0 DOCUMENTATION

4.1 General

4.1.1 The Installation Supplier shall use documents identified by the Environmental Management organization to manage hazardous materials/wastes. These may include:

a) Hazardous Waste Manifests

b) Bills of Lading

c) Material Disposition Record Forms

1. Material Disposition Record (“MDR”) – A document completed from the point or site where central office scrap is generated, itemizing the type of material, location address, and project information. A MDR shall be completed by the installation or removal contractor and the AT&T central office engineer. A copy of this document is kept with the project folder and an additional copy shall accompany the material that is sent to the material reclamation center.

4.1.2 The AT&T LEC Engineer shall forward to the Environmental Management Office the original documentation as described in Section 1.1.5 and place a copy in the yellow wallet.

5. QUESTIONS

5.1 General

5.1.1 Further questions or clarifications regarding the proper management of hazardous materials or wastes may be directed to the Environmental Management Office.

TABLE V-1 – SUMMARY OF CHANGES IN SECTION V

Change	Item in 11/1/05 Issue	Item in this issue
Revised		
Deleted		
Added		

[END OF SECTION]